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Practical Wireless

3D.

Published every Wednesday by
GEORGE NEWNES LTD.
Vol. 1 —— No. 19
JANUARY 28th, 1933
Registered at the G.P.O. as a Newspaper.

THE HOME CONSTRUCTORS HANDY GAUGE

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KIT "C" As Kit "A" but with valves and cabinet. CASH or C.O.D. Carriage Paid. £6/13/3 or 12 monthly payments of 12/3.

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Trade Mark

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THESE ARE THE PARTS YOU MUST USE TO QUALIFY FOR THE EDITOR'S PERSONAL GUARANTEE

	£	s.	d.
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1 **LISSEN** 2 megohm Grid Leak with wire ends		1	0
1 **LOTUS** two-gang .0005 condenser with disc drive Type P.C.2		14	0
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1 **TELSEN** .0003 differential reaction condenser W.185..		2	6
1 **TELSEN** Pentode Output choke (Type W. 72)		7	6
8 **ERIE** Resistances (1) 100,000, (2) 30,000, (1) 5,000, (4) 1,000 ohms. 1 Watt Type		8	0
1 **BULGIN** Fuse and Holder Type F.5 ..		1	0
1 **BULGIN** S.G. choke, H.F.4		5	0
1 **WEARITE** three point switch, GWC ..		1	3
1 **WEARITE** S.G. H.F. Choke, type HFPA ..		4	0
1 **PETO SCOTT** Standard screened HF choke		3	6
2 **DUBILIER** .1+.1 mfd. condensers type B.E. 31 L		6	0
3 **DUBILIER** 1 mfd. condensers type B.B. ..		7	6
2 **DUBILIER** .0003 mfd. condensers type 665		1	0
1 **DUBILIER** .0002 mfd. condenser type 665			6
1 **LEWCOS** 50,000 ohms Potentiometer ..		3	0
1 **SOVEREIGN** .0003 pre-set condenser ..		1	3
1 **READY RADIO** 3 to 1 L.F. Transformer ..		8	6
3 **CLIX** Wander Plugs, (2) GB—, (1) GB+ ..			4½
3 **CLIX** 4-pin Sub-Baseboard Valve Holders..		2	0
1 **CLIX** 5-pin Sub-Baseboard Valve Holder			9
1 **BELLING LEE** four-way Battery Cord ..		1	9
3 **BELLING LEE** Terminal Mounts		1	6
6 **BELLING LEE** Type "B" Marked Terminals		3	0
1 **PETO-SCOTT** Red Triangle Ebonite Panel 16 x 8in. Ready drilled		5	6
1 **PETO-SCOTT** Plywood Baseboard, 16 x 10 x 3-8 and 2 side strips 10 x 2" ..		2	0
Screws, Insulated Connecting Wire, Flex, etc.		2	6
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THE PREDOMINANT WIRELESS WEEKLY

Practical Wireless

EDITOR:
Vol. 1. No. 19. || F. J. CAMM || Jan. 28th, 1933.
Technical Staff:
H. J. Barton Chapple, Wh.Sch., B.Sc. (Hons.), A.M.I.E.E.
Frank Preston, F.R.A., W. J. Delaney, W. B. Richardson.

ROUND *the* WORLD *of* WIRELESS

Hungary Launches Out

THE 18.5 kilowatt transmitter at Lakihegy, which broadcasts the Budapest programmes, will be replaced in September, 1933, by a new 120 kilowatt station. To relay the capital entertainments, a 3 kilowatt transmitter on the Island of Csepel operates on 840 m. between 7.0 and 11.0 p.m., G.M.T. Two of the four relays to be added to the Hungarian broadcasting system are already testing; they are Magyarovar (6 kW) on 209.7 m., and Nyiregyhaza (6·kW.) on 267.8 m. A further station is under construction at Pecz, formerly Funfkirchen. Should it be found that with the existing transmitters a fully adequate service cannot be given to the country, Hungary proposes to build *five* more stations to work on the lower wavelengths.

Short Wavelengths for Broadcasters

ACCORDING to a decision taken at the Madrid Conference, a new waveband comprising 25,600-26,600 kilocycles (11.07-11.27 metres) has been granted for the use of broadcasting stations. With a 9 kilocycles separation, not less than 111 transmitters could be housed in this section. In addition, in future no spark stations will be allowed to use the 220 metre band between 9.0 a.m. and 10.0 p.m. G.M.T., and thus interference by morse signals from shipping, etc., will be obviated.

With a view to an attempt to clean up the ether, it was also generally agreed that the installation of new transmitters, proposed alterations in wavelengths, or the transference of stations to other than their original sites should first receive the approval of all European States.

Radio Camouflage

AT the studio of one of the small Belgian transmitters, the announcer, in addition to his duties, is compelled to double parts in plays broadcast. On a recent occasion, much to the delight of listeners, at the end of a dramatic sketch he was heard to say: *You have stabbed me! My blood be on your head;* following which, inadvertently in the same voice he added: *and that, Ladies and Gentlemen, concludes the broadcast of our play, The Red Hand Murder!*

Germany's Education Push

OF 55,000 schools existing in Germany, over 20,000, with an aggregate number of two and a half million pupils, are equipped for the reception of the educational courses broadcast by Königswusterhausen.

Birds in a Gilded (?) Cage

AT the WEAF, New York, studio, situated on top of the new Amsterdam Theatre in that city, the platform from which the broadcasts are carried out is separated from the audience by a huge glass screen. In this manner more than six hundred spectators may view the artists without disturbing the entertainment.

The First Radio Singers

IT is not generally known that the first relay of an operatic performance took place at New York on January 13th, 1910. On this occasion the voices of Caruso and Emmy Destinn in Puccini's *Tosca* were transmitted, at low power, from the roof of the Metropolitan Opera House in that city.

New Interval Signal

FOLLOWING a competition organised by the Poste Parisien, Paris, the studio officials have adopted, from the numerous suggestions put forward by their listeners, a posthorn, as used by the old mail coaches, for their interval signal. Every possible kind of sound was submitted by the twenty thousand competitors; they included a peal of laughter, and even the cooing of a dove, as the universal messenger of peace!

An Effective S O S

DURING recent manœuvres in California, fourteen naval aeroplanes, which were to land at San Diego, were caught in a thick fog. At the request of the authorities, the local transmitter (KGB) was requested to broadcast an appeal to the inhabitants of the city to rush as many motor-cars as possible to the airport so that their headlights would clearly show up the field. Within twenty minutes of the announcer's call *three thousand cars* left for the airport, and in the glare of six thousand head-lights all aeroplanes glided safely to earth.

MR. W. BRYAN SAVAGE, of 292, Bishopsgate, has moved his offices and works from the above address to a new model factory at 56/58, Clerkenwell Road, E.C.1, with a goods entrance at 25/27, Great Sutton Street.

Soviet Radio Developments

WITH the population of Moscow approaching the three million mark, the authorities now contemplate a listening tax which is to be graded according to the classes of the community. Members of the Red Army, who are forced to listen to the broadcasts during certain periods of the day, will only pay fifty copecks; students and war invalids will be placed on the same footing. On the other hand, a larger revenue may be derived from civil servants and military and naval officers, who are to be mulcted to the extent of two roubles. The heaviest tax is to be imposed on business men and other persons connected with industries and trade. At present Russia operates 59 broadcasting stations with an aggregate energy of 1,498 kilowatts, but further high-power transmitters are being shortly added to the system.

We hope the Berne Bureau will bear in mind the present state of the ether!

ROUND *the* WORLD *of* WIRELESS *(Continued)*

Listen to the Argentine

LR2 (*phon : Ell air dos*) Radio Patria is the call of a new transmitter at Buenos Aires, Argentine Republic, which, operating on 231.5 m. (1,295 kc/s), is frequently well heard in the British Isles between midnight and 2.0 a.m. G.M.T. If you wish to search for it, tune in either of the Hamburg relays, Flensburg or Kiel, in the earlier part of the evening, make a note of the condenser settings, and when the European stations have closed down, twirl the dial slowly over the small section included between 227.4 and 232.2 metres.

New Wavelengths for German Stations

IN view of the fact that certain channels allotted to other countries and borrowed by Germany must now be returned to their owners, a rearrangement is to take place in the wavelengths of some of the transmitters. It is expected that the 5 kilowatt Freiburg-im-Breisgau station, and the new Trier relay will be ready for operation within the next five or six weeks. They will take the Frankfurt-am-Main programme instead of that of Stuttgart as originally planned, and will work on 259 metres (1,157 kilocycles). In addition, as Portugal requires the 283 metre channel for the Lisbon high-power station under construction, the Berlin relays Magdeburg and Stettin in common with Bremen, Hanover, and Flensburg, which up to the present have broadcast the Hamburg radio entertainments will all operate on 227.4 m. (1,319 kilocycles). The construction of the new high-power transmitters destined to Berlin and to Hamburg is being hurried forward.

When the Regional plan is complete, an entire readjustment and re-allocation of the German wavelengths may take place in co-operation with neighbouring countries.

New Radio Musical Comedy

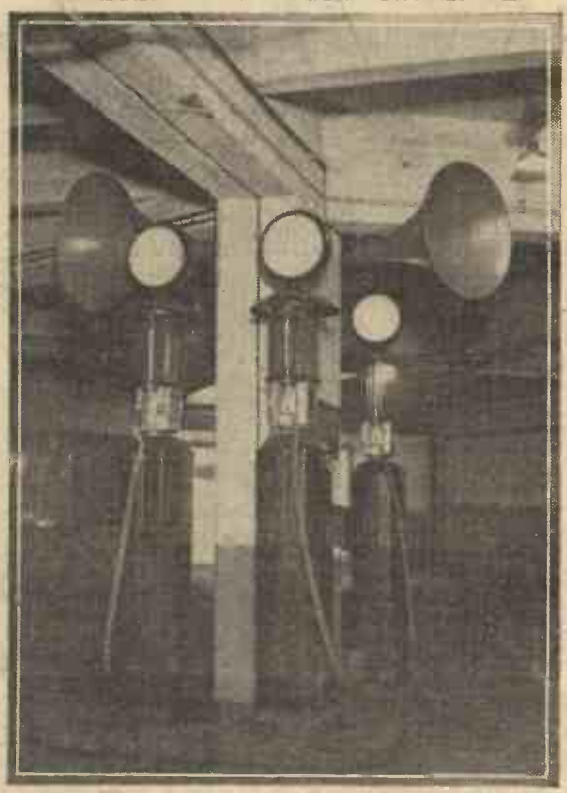
THE Castle on the Hill is the title chosen for an original operetta which will be broadcast by the B.B.C. transmitters in March. It is being specially written for the microphone by C. Denis Freeman with music by Mark A. Lubbock, the authors of *The King can do no wrong*. One of the main features of this show is the inclusion of three orchestras, one of which is a Tzigane band, as the plot is enacted in Hungary at the time of the 1919 revolution.

1932 Relays to the U.S.A.

IN the course of eleven months the National Broadcasting Corporation of America relayed 149 radio programmes from foreign countries and of which respectively twenty-one and fifteen were contributed by Great Britain and France. The list was topped by Switzerland, which supplied the United States with forty-three transmissions, Germany coming a good second with thirty-two broadcasts. In addition, the Columbia network carried out one hundred and ten foreign relays from thirty-three cities in nineteen different countries during the same period. Most of these transmissions are taken on short-waves *via* such stations as Rugby, Prangins, Berlin-Nauen and Kootwijk.

INTERESTING and TOPICAL PARAGRAPHS

WIRELESS AND THE CRIMINAL



In a French police headquarters motor garage is installed a central wireless post, connected up with the headquarters. A number of drivers are always near at hand ready to leave for any place on receipt of the order. In the garage are installed petrol pumps which can fill up at the rate of 60 litres a minute and the reservoirs have a capacity of 5,000 litres.

A Giant of Volts and Watts

THE new Munich super-power station which you may hear every evening on 532.9 metres, although possessing an aerial energy of 75 kilowatts, is so planned that its power can be doubled at comparatively short notice. For a radiation at the lower of the two ratings some 450 kilowatts are required, and this energy is drawn from the Finsing generating station which supplies through a five mile cable a current reaching some 20,000 volts.

Calls from Venezuela

BETWEEN midnight and 4.0 a.m. G.M.T. daily, and again between 5.0 and 7.0 a.m. listeners on the short-waves should pick up a transmission on 48.95 metres (6,127 kilocycles) emanating from the station *La Voz de Lago* (YV11BMO) at Maracaibo (Venezuela). Although its power is only one quarter kilowatt, signals in many instances may be received at good loud-speaker strength. YV1BC, a station owned and operated by the *Cia Anonima Venezolana de Radio* at Caracas is also to be found broadcasting between 10.0 p.m. and midnight on 49.6 metres. Announcements are made in both Spanish and English. Tests are made nightly, but the quality of the transmission is poor.

The Prince's New Aeroplane

OUR greatest propagandist, H.R.H. the Prince of Wales, has just placed an order for a big aerial limousine, which will be one of the largest and fastest private aeroplanes in the country. "Bristol" engines, of the same type as Captain Uwins used when he recently broke the world's altitude record, will be incorporated in the Vickers' "Viastra" aeroplane which will have a seating capacity for twelve persons besides the two pilots. But perhaps the most interesting part of the equipment is a large and powerful wireless set that will be installed in the cabin, and which will be able to pick up broadcasting as well as inter-aerodrome communications.

Mixed Pickles

IN a recent broadcast carried out by WEAF, New York, from Ellis Island, the immigration station in New York harbour, the programme included items by a Spanish soprano, an Italian tenor, a Russian bass, a Japanese xylophone player, a French singer, a German baritone, an English pianist, a Danish accordionist and a Lettish choir. The concert was conducted by a Hungarian, and all announcements were made by a Czech! An All-American programme!

New Brussels Studio

BROADCASTS of entertainments on a larger scale than has hitherto been attempted may be expected from the Brussels station in the near future. An up-to-date building is to be erected at Ixelles, one of the main suburbs of the Belgian capital, and will contain a number of studios and a concert hall.

SOLVE THIS!

Problem No. 19.

After nearly a year's use, Jackson found that the batteries of his set were nearly expired. He therefore bought a new H.T. and a new G.B. battery and connected these to his set. When he switched on, however, he got no signals, although he heard a "click" in the Loud Speaker. What do you think he had done to prevent the reception of signals? Three books will be awarded for the first three correct solutions opened. Mark envelopes Problem No. 19, and send to the Editor, PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2, to reach us not later than January 30th, 1933.

SOLUTION TO PROBLEM No. 18.

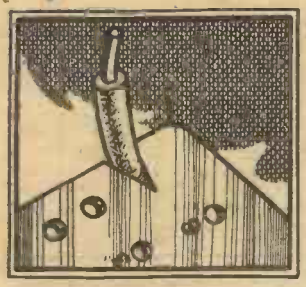
Smith joined the Potentiometer across the L.T. terminals instead of across the filament terminals of a valve-holder, and therefore the On/Off Switch did not disconnect the Potentiometer when the set was switched off. Consequently, the accumulator was discharging through the potentiometer the whole time.

The following three readers received books in connection with Problem No. 17.

E. Hurst, 82, Farrance Street, Limehouse, E.14; A. Reed, Grove Street, Kirton-Lindsey, Lincs; F. N. Bedwell, Rosemont, Evesham Road, Stratford-on-Avon.

How to use our free gift Handy Gauge

Your Gauge is in the envelope attached to the cover of this week's issue.



Using the gauge as an insulation stripper. This notch may also be used to clear screw threads.

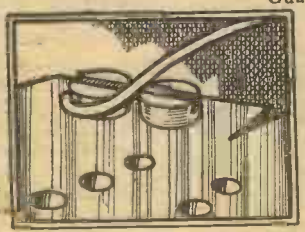
ON the cover ofevery copy of this week's PRACTICAL WIRELESS is an envelope containing our indispensable Home Constructor's Handy Gauge. It is made of steel and specially designed to withstand hard use. The various uses to which the gauge may be put are shown pictorially on this page. You should remember that it is an accurate engineer's gauge and treat it, therefore, with care.

The lower series of holes relate to the diameters of B.A. Screw Sizes from No. 0 to No. 6 and the centre series of holes give the corresponding Tap Drill Sizes. For purposes of comparison a table is given at the foot of the centre column showing the diameters of the screws, and the diameter of the corresponding tap drills. It should be remembered that the drill diameter corresponds approximately to the core diameter of the appropriate screw-thread.

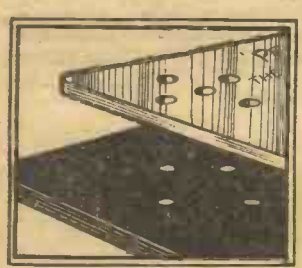
EXPLICIT INSTRUCTIONS ON THE MANY USES TO WHICH OUR FREE-GIFT GAUGE MAY BE PUT

As a Screw Gauge

The bottom series of holes marked "B.A. Sizes" may, therefore, be used as a gauge for the diameter of B.A. screws, so that if you require to know the number of a particular screw you merely try it in the holes and select one in which it is a nice fit. The number above the hole indicates the correct B.A. size.



Forming loops on the end of the wire.



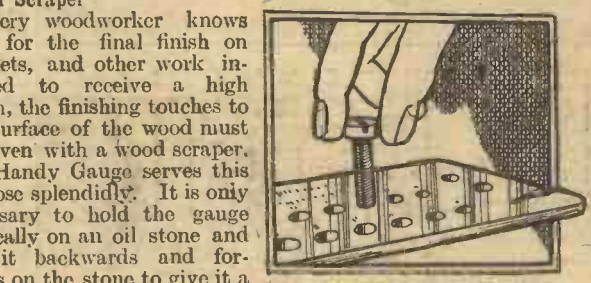
Using the gauge to mark out valve leg holes for three-electrode valves.

Valve Leg Gauge

It is often found necessary to drill holesthrough ebonite, etc., to take valve legs of triode and pentode valves. The holes to the left of the gauge, therefore, accurately made to B.V.A. standards, may be used as a drill gauge for this purpose, the holes being the correct diameter for valve legs.

Wood Scraper

Every woodworker knows that for the final finish on cabinets, and other work intended to receive a high polish, the finishing touches to the surface of the wood must be given with a wood scraper. Our Handy Gauge serves this purpose splendidly. It is only necessary to hold the gauge vertically on an oil stone and rub it backwards and forwards on the stone to give a smooth edge with two cutting surfaces. The illustration shows how it should be used.



Gauging the diameter of a screw thread.

Gauging the diameter of a drill.

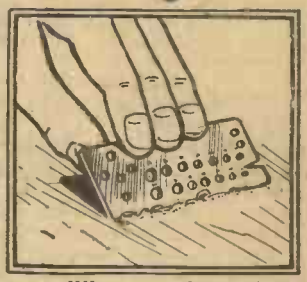
Stripping Insulation from Wire

On the right of the gauge is a V-slot chamfered off. This slot will probably be used far more than the other parts of the gauge, for by slipping the wire into this notch and rotating the gauge round the wire two or three times the insulation will be severed and a pull on the gauge will remove the desired piece of insulation. It will be found that this notch is a most effective insulation stripper.

B.A. SIZES:	0	1	2	3	4	5	6
DRILL SIZES FOR TAPPING	10	17	24	29	32	37	43

The Gauge as a Universal Trammel

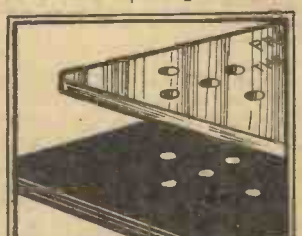
The gauge may also be used as a trammel for scribing the position of holes of odd diameters by screwing the gauge down by one of the two corner holes and using a pencil in an appropriate hole. It will be found that a wide range of hole diameters can be scribed in this way.



When one edge is sharpened on an oil stone, the gauge makes a splendid wood scraper.

Stripped Threads

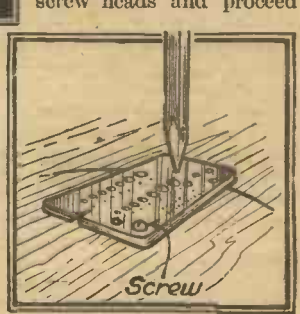
Every home constructor has experienced the annoyance caused by a screw whose top thread has closed over on to another, thus preventing the nut from being screwed on. In such a case insert the threads in the V notch and wind the gauge towards the end of the screw or bolt. This will rapidly clear the thread. The gauge itself is made in 21-gauge steel, equivalent to a thickness of .032in. This fact is mentioned as readers might like to use it as a comparator for 21-gauge, and under.



The gauge in use for marking out holes for 5-pin valves.

Loop Forming

In one end of the gauge you will find two holes close together. By placing a couple of screws in these holes loops may be formed on the end of wire. Place the end of the wire in the slot of one of the screw heads and proceed to pull the wire round the head of the second bolt. In this manner the gauge forms a perfect loop.



The gauge in use as a universal trammel.

THE DESIGN AND OF SIMPLE

In This Article, FRANK PRESTON, F.R.A., gives

Fig. 5.—A cabinet.

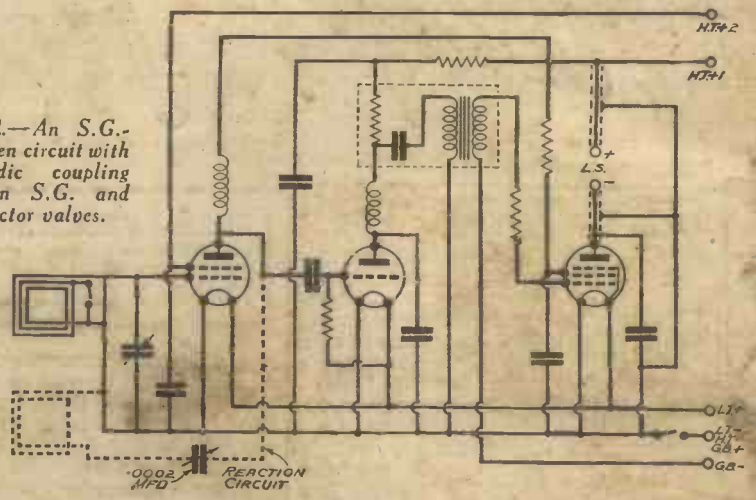


Fig. 2.—An S.G.-Det-Pen circuit with aperiodic coupling between S.G. and detector valves.

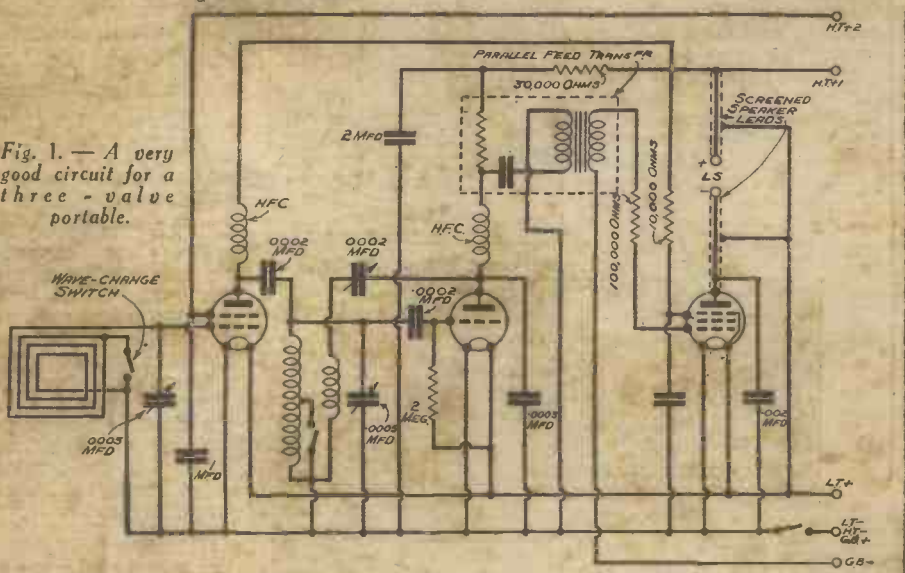


Fig. 1. — A very good circuit for a three - valve portable.

IT is very evident from the letters sent to us by many of our readers that portable sets, especially those which can be built easily and at low cost, are greatly in demand. Several readers have asked for a constructional article on a simple and effective portable set, and they may rest assured that their needs will be catered for by at least one complete design which will be published in future issues of PRACTICAL WIRELESS, but I have no doubt that there is a large number of experimenters and constructors who would like to design their own in such a way that use can be made of components which happen to be on hand. For this reason I feel sure that some information regarding the main features underlying the design of portable sets as a whole will be appreciated.

Principal Requirements of a Portable

Let us first consider what are the principal requirements of a successful portable. First and foremost the set must be compact; it must also be light in weight and economical in its consumption of high and low tension current. Since a frame aerial must be used as a "collector," efficiency at the high-frequency "end" must be as high as possible. The degree of low-frequency amplification need not be very great because enormous volume will not be expected; even if it were it could not be obtained since we are (due to considerations of weight) restricted to the use of a balanced armature type of speaker unit.

The Circuit

As when designing any type of set, the first thing to consider is the circuit which shall be employed. Naturally, this will depend very largely on the range of reception and volume level required, as well as upon the permissible weight and size of the complete outfit. As a matter of fact, the weight of the receiver itself will not be very great in any case, and will be much less than that of the batteries. But the design of the set will determine the battery current, and, therefore, battery size, and so we must consider the outfit as a whole rather than think of any one part separately.

Theoretically, it would appear that two stages of S.G. amplification would be desirable to compensate for the small signal pick-up of the frame aerial, but in

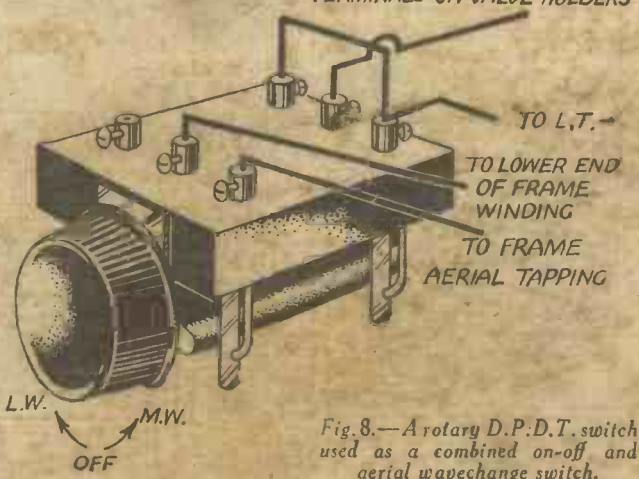


Fig. 8.—A rotary D.P.D.T. switch used as a combined on-off and aerial wavechange switch.

CONSTRUCTION PORTABLE SETS

you some Useful Information on a Popular Subject

practice it is found very difficult to obtain adequate stability with such an arrangement, and as a result the "two-S.G." portable is practically unheard of. Moreover, a single S.G. stage, if well designed, will permit of really astonishing long-distance reception, whilst being fairly easy to design and not difficult to tune.

S.G.-D.-Pen

The circuit of Fig. 1 has a single S.G. valve followed in turn by a detector and pentode, and is an arrangement which I can recommend with confidence. Coupling between the first two valves is on the tuned-grid system, and therefore two tuning condensers are required. But the two latter components *can* be ganged together if one is prepared to go to a little trouble in adjusting the size of the frame aerial and inserting "padding" condensers, of which I shall say more later on. Reaction is applied to the tuned grid coil through a .0002 mfd. variable condenser and reaction winding. Practically any type of screened dual-range coil will be suitable for the tuned grid circuit. The output from the detector is supplied to the last valve through a parallel-fed transformer which is more efficient, and lighter in weight, than a good transformer of the normal type. Ample decoupling of the detector valve is necessary to prevent interaction and is provided by a 30,000 ohm resistance and 2 mfd. condenser. A 100,000 ohm resistance is inserted in the grid lead to the pentode to improve stability by preventing the passage of H.F. currents. If by chance any H.F. currents *do* find their way into the output stage a .002 mfd. fixed condenser is connected between the anode of the last valve and H.T. negative to by-pass them. It will also be seen that the priming grid of the pentode is decoupled by means of a 10,000 ohm resistance and 1 mfd. condenser; this decoupling might not be essential in every case, but it will ensure L.F. stability. The values of all components not mentioned are indicated on the circuits; no details are given of the frame aerial, but this item will be fully dealt with later.

Aperiodic H.F. Tuning

The circuit of Fig. 1 is distinctly satisfactory, and if well "interpreted" will afford good reception of at least a dozen stations under average conditions. It could be made a little more powerful by substituting a two-stage L.F. amplifier for the pentode, and in that case a few more stations would be available at good strength. This circuit has one "fault," however; either two tuning controls are necessary or a fair amount of care and skill must be exercised in "matching" the tuned circuits.

Fig. 4.—A suitcase type of portable.

The latter objection can be removed by eliminating the tuned grid circuit, and so making the detector tuning aperiodic, as shown in Fig. 2. This will of necessity make the receiver noticeably less efficient, but it will still be suitable for more "local" reception. The greatest loss is caused, not by the elimination of a tuned circuit, but by the removal of the reaction control, which was previously effective on the tuned grid coil. But reaction can be applied by adding another winding to the frame aerial and connecting one end of this to the anode of the S.G. valve through a .0002 mfd. variable condenser as shown in broken lines. When reaction is employed in this way the set will show a fair degree of efficiency, and will have a range sufficient to cover a few of the more powerful stations both at home and on the Continent. All component values are the same as those shown in Fig. 1.

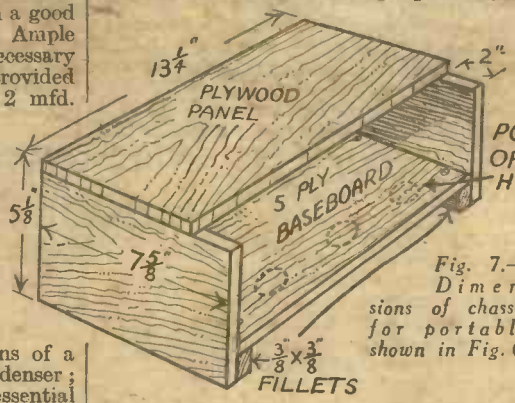


Fig. 7.—Dimensions of chassis for portable shown in Fig. 6.

A receiver made according to the circuit of either Fig. 1 or Fig. 2 will require only about .45 ampère of low tension and some 6 or 7 milliamps of high tension current, and both batteries may thus be of the smallest capacity. The high tension battery should have a maximum voltage of no less than 99, when "H.T.+ 1" will be taken to the highest tapping, and "H.T. + 2" to about 60 volts. To ensure that the H.T. consumption is as low as possible, the highest grid-bias voltage consistent with good "quality" should be employed.

Det.-2 L.F.

Another type of circuit, which, so far as I am aware, is not used for any commercial portable on the market, is that comprising a detector followed by two L.F. stages. It would appear that such a circuit would be practically useless for a set operating on a frame aerial, but I can say from experience that this is not by any means the case. A well-designed Det.-2 L.F. portable, with sensitive reaction control, is a remarkably efficient instrument capable of excellent reproduction from the nearer Regional and National transmitters. I have a set of this kind in use at the present time, and although it was built for purely "local" reception, it will bring in such stations as Radio-Paris, Fécamp, Warsaw

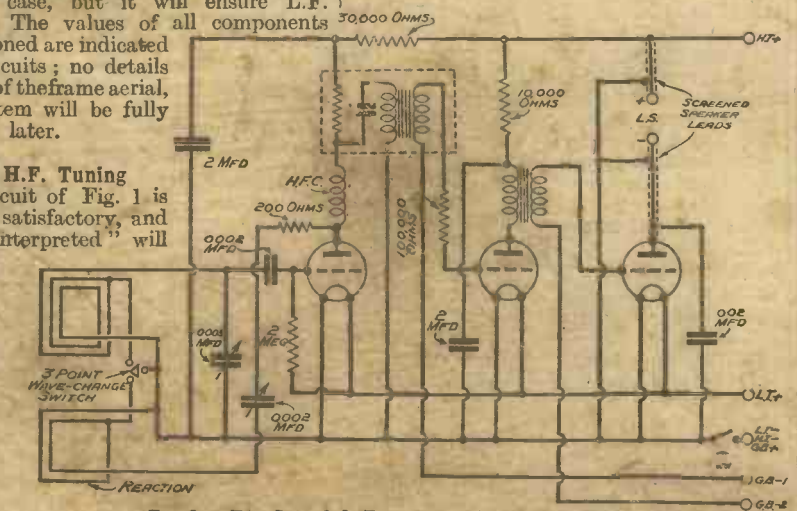


Fig. 3.—The Det.-2 L.F. circuit referred to on this page.

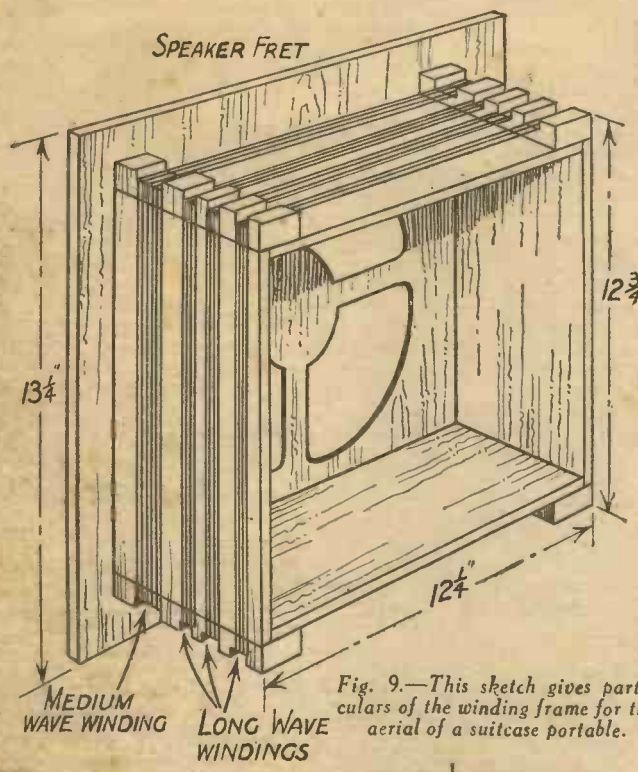


Fig. 9.—This sketch gives particulars of the winding frame for the aerial of a suitcase portable.

and Leipzig at almost any hour of the day. Admittedly, these latter are not received at great volume, but they are sufficiently loud to be worth listening to.

A circuit of the set just referred to is shown in Fig. 3, from which it will be seen that it is remarkably simple. The frame aerial is provided with a reaction winding which operates through the usual .0002 mfd. reaction condenser. A 200 ohm, non-inductive resistance is inserted in the lead from the anode of the detector valve to the reaction condenser to "steady" reaction control and to prevent the setting up of any spurious oscillation effects. The reaction winding is tapped, so that a portion is short-circuited simultaneous with the short-circuiting of the long-wave tuning winding by means of a three-point wave-change switch. By carefully choosing the correct number of reaction turns, and the most suitable tapping point, reaction control remains almost uniform over both wavelength ranges.

Apart from the use of a frame aerial, the circuit is very similar to that of a really modern Det.-2 L.F. receiver of the "fixed" kind, and is not unlike that of the "Selectone," recently described in these pages. Decoupling is very thorough, resistances and condensers for this purpose being included in the anode circuits of both the detector and first L.F. valves. The detector feeds the first amplifying valve through a parallel-feed transformer and a 100,000 ohm "stopper" resistance is included in the grid circuit of the second valve. The last (power) valve receives its input through a tone-control transformer, which is useful in compensating for the high-note loss almost inevitably occasioned by the extremely selective tuning circuit. As a result, the set is capable of providing very good quality reproduction at a reasonably high volume level. In the circuit reproduced, grid-bias is obtained in the usual way from a 9-volt battery, but it would be rather better to provide automatic bias in the manner explained on page 323 of PRACTICAL WIRELESS No. 7. A set made according to the circuit of Fig. 3 will be even more economical in both H.T. and L.T. current than one using the circuits of Figs. 1 and 2. It will, in fact, take only about .35 ampères of low tension and some 6 milliamps of high tension current, when operated at suitable voltages.

One of the three circuits given, or a slight modification of one of them, will satisfy practically any requirement, so, after deciding on the one to be used, attention can be turned to the practical constructional details.

The Containing Case

The exact form of construction will depend primarily upon the type of containing case preferred. This might be either of the suitcase or cabinet pattern, as typified by one of the sketches, Figs. 4 and 5. If the set is to be really portable, and carried about from place to place, the suitcase is certainly to be preferred, since it can be closed up and rendered less susceptible to jolts and jars. In addition, since the frame aerial is more remote from the set than is the case with a cabinet portable, there is rather less danger of unwanted reaction and H.F. instability. But, on the other hand, the cabinet style of container is rather easier to make (and cheaper to buy), whilst being somewhat more convenient for use in the home. It also has rather more speaker accommodation, so that a larger unit can be employed, and, being of greater over-all dimensions, allows the frame aerial to be rather larger and more sensitive. I think I have given a fair statement of the "pros" and "cons" of both types, so I must leave the final choice entirely with you.

Suitcase Type

And now, for the moment, I will suppose that you have decided to make your set in suitcase form. The size of the container must first be settled on, and the dimensions given in Fig. 6 are suitable for practically any set having up to four valves. The battery compartment will accomodate a 99-volt high tension battery of standard type (measuring 9½in. long by 5⅛in. wide by 3in. high), a 9-volt grid-bias battery, and a 2-volt unspillable accumulator, such as the Exide type PC3, measuring approximately 5in. by 3½in. by 3¼in. It need not be mentioned that it is absolutely essential for a set of this type that the accumulator should be unspillable, because it will occupy various positions when the set is being moved about. Notice that a space is left between the battery partition and the bottom of the case; this allows all the battery leads to be passed through without the necessity of removing wander plugs.

Receiver Chassis

The chassis of the set may be of various patterns, but that shown in Fig. 7 is one that I have found particularly good. Since the baseboard is carried on fillets, much of the wiring can be done below it, and this makes for improved appearance. All battery, frame aerial, and loud-speaker leads are taken from the underside of the baseboard, and so they can pass straight through the gap in the partition without being visible at all.

The actual disposition of the components will depend very largely upon the circuit used, but in any case the rules governing the layout of a normal receiver (and dealt with in a previous article) will apply. Screening, by means of aluminium plates, is difficult to arrange in a suitable manner, so it is much better to use screened components wherever possible. Screened-grid, detector, and first L.F. valves should certainly be of the metal-coated variety, whilst coils, if used, should be enclosed in screening cans. Although not always essential, it is also very desirable that screened H.F. chokes should be employed. In addition, when two chokes are used they should be of entirely different patterns, because if they have similar characteristics there is always a danger of uncontrollable oscillation setting in at certain wavelengths.

(To be continued)

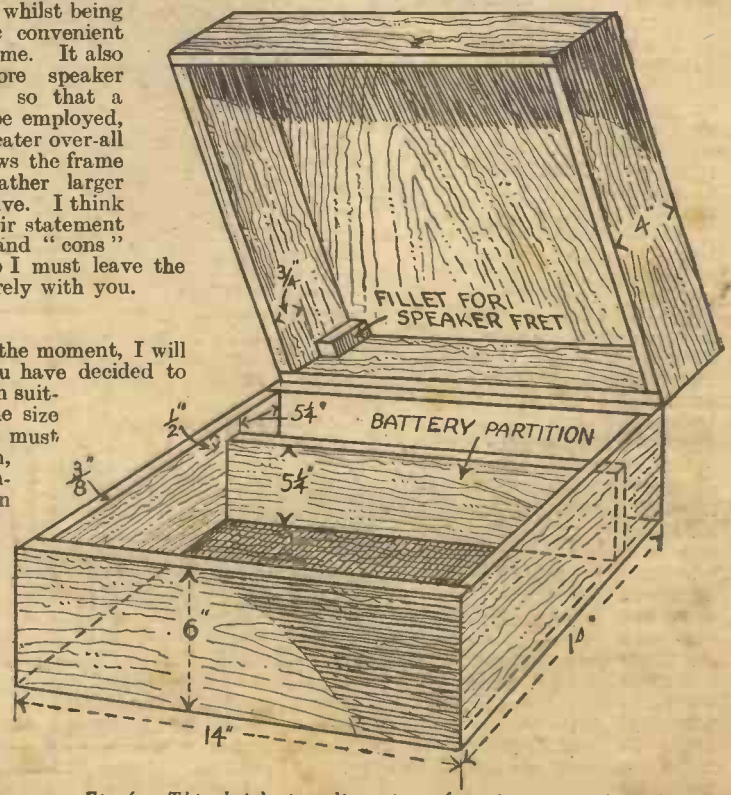


Fig. 6.—This sketch gives dimensions of a suitcase container.

POINTS RELATING to CAPACITY

This Article Describes some Interesting Facts about Condensers, both Fixed and Variable

By GILBERT E. TWINING

A CONDENSER is made up of two or more conducting plates separated by some kind of insulator known as a dielectric, such as air, mica, paper, or

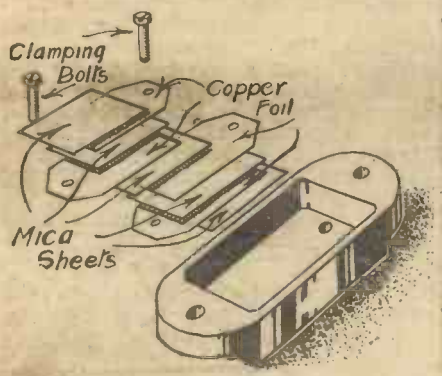


Fig. 1.—The construction of a small fixed condenser.

bakelite. The capacity of a condenser depends upon the area of the plates, the distance between them, and the nature of the insulation; the bigger the plates or the closer they are together, the greater the capacity. It offers a complete barrier to direct current but is often spoken of as not preventing the flow of alternating current. In Fig. 1 is shown in elementary form the make-up of a small fixed condenser having a capacity of .0002 microfarads.

Capacity

Capacity is the measure of quantity of electricity which a condenser is able to store, the unit of capacity being the farad. In wireless practice, however, the farad is too large a unit, and so the microfarad is used, which is one millionth part of a farad (mfd.).

Connecting to a Battery

If the two terminals of a condenser are connected to the positive and negative plates of a battery respectively, see Fig. 2, a great movement or activity of electrons—particles of electricity—will take place, for there is always a universal balance of electrons to be maintained. This means that when there is a deficiency of electrons at any point, then to that point will they flow in an attempt to make good any shortage that may exist. Now the work of a battery is to create an electron shortage, and consequently its positive means an electron shortage and negative implies an abundance of electrons, the plates of the condenser which are connected to the respective terminals on the battery will likewise become positive (short of electrons), and negative (an abundance of electrons). This electron movement from the battery will cease when the potential difference—difference in voltage—between the plates of the condenser are exactly the same as the battery.

The Dielectric

The insulation, or dielectric as it is called, plays a big part in the working of the condenser, for when a current is applied, the electrons tend to move over to the positive plates in an attempt to balance the deficiency of electrons, although, due to their rigid cohesion to the matter with which the dielectric is composed, they are unable to do so, but the strain on the electrons is greatly increased. If the electron shortage is so intense on the positive plates, that is to say, if too high a voltage is connected across the condenser, the electron strain will become too great and the current will force its way through the dielectric from the negative side and the insulation will break down; the condenser will then have short circuited and sparked across.

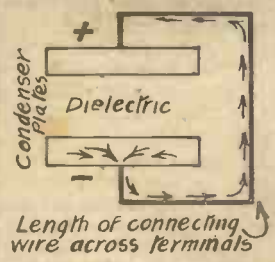
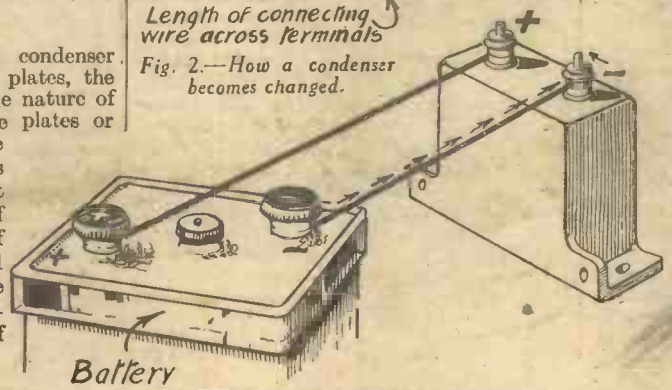


Fig. 2.—How a condenser becomes changed.



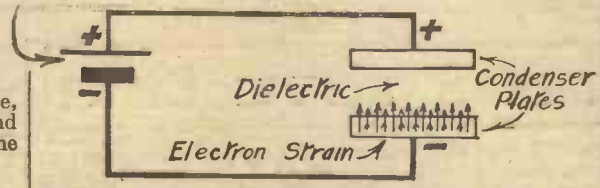


Fig. 3.—Discharging a condenser and thus enabling the electrons from the one plate to flow round to the other side through the conductor and so regain their balance.

Storing Electricity

When the battery which has been coupled to the condenser is removed the condenser will be left in a charged state, one plate will be negative and the other positive. If the two plates are joined together, or short circuited by a length of wire, a small current will momentarily flow, for the electrons at the negative terminal will rush round to the positive terminal until a balance is obtained and the strain on the insulation will be removed, see Fig. 3. Therefore, it can be understood that the condenser is able to store electricity or electrical energy in the form of an electrical field between the plates; this also explains the reason why quite an appreciable shock may be had from a large condenser of 2 mfd. or over if the terminals are accidentally touched after the working current of the set is switched off.

Reverting back to the remark that a condenser does not prevent the flow of alternating current, this is not quite correct, for, if it did not prevent the flow, it would of course mean that the condenser had broken down. What actually happens when the condenser is connected to an alternating current supply is that the electron shortage will be alternately created on each side of the condenser, the electrons rushing to and fro, first to one set of plates back to the source of supply and thence to the other set of plates, but the balance of electrons will not be obtained by the current passing through the condenser. It is generally assumed though, for simplicity sake, that an A.C. current is able to be communicated through a condenser.

Care When Choosing Condensers

It will be seen from what has been written why it is so necessary, when building up a set, especially a mains receiver, to make quite sure that the condensers selected are suitable for their positions, for, should they be placed in a set where they are subjected to too high a voltage, they are bound in time to break down with sometimes disastrous results to other components in the set. Where fixed condensers are used in mains sets for smoothing the supply and also those used as by-pass condensers, in fact, any of 1 mfd. and over, special attention has to be paid to their insulation, or rather the dielectric used, for when the supply from the mains is first switched on the surge of current might be so great, sometimes being two to three times the normal voltage, that if ordinary voltage condensers are used they would

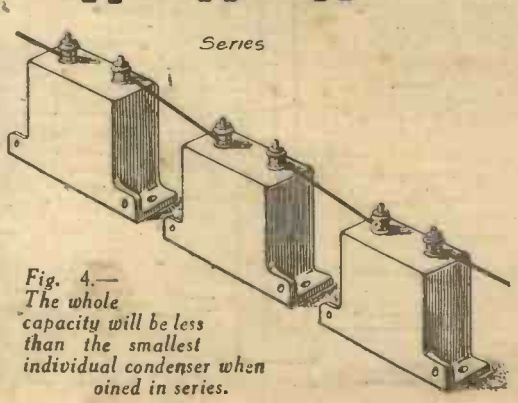


Fig. 4.—The whole capacity will be less than the smallest individual condenser when oined in series.

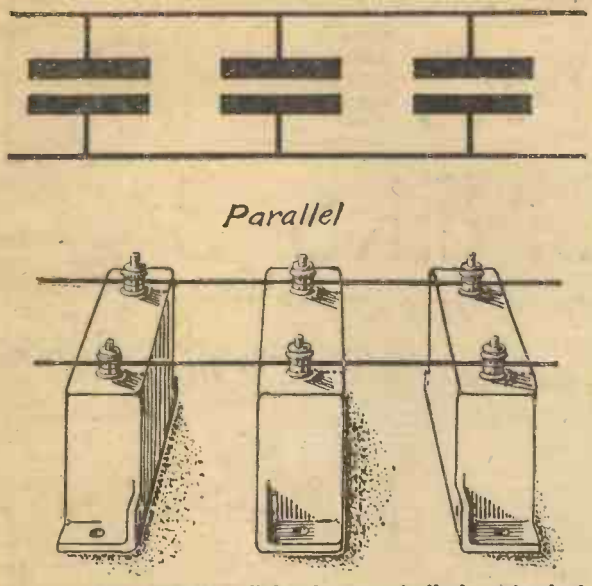


Fig. 5.—The capacity will be the sum of all the individual capacities when joined in parallel.

quite probably break down, therefore, condensers tested up to five or six hundred volts, or more, according to the voltage applied to the set, should be used.

Series or Parallel

When condensers are connected in series, as in Fig. 4, the capacity of the whole will be less than the smallest individual condenser, but when connected in parallel, as in Fig. 5, the capacity of the condensers will be the sum of all the individual capacities.

Variable Condensers

As mentioned before, a condenser is able to store electrical charges in the form of electrons. In the case of a tuning condenser the amount, or rather the capacity, is variable. It is adjustable by means of movable plates working within fixed plates. When the amount of overlap of the movable plates is at the minimum the condenser has very little capacity, but, when they are completely overlapping, the maximum capacity is obtained. The tuning condenser, generally of .0005 mfd. maximum capacity, is connected across the aerial coil (see Fig. 6); its work is to momentarily store up the current collected by the aerial. The aerial picks up an alternating current of very high frequency, and in exactly the same way as before explained for A.C. currents, it charges one side of the condenser, but through the condenser being connected to the coil it at once discharges from the one set of plates, and flows through the coil to the other side of the condenser in an endeavour to maintain the balance of electrons.

Electron Flow

The flow of electrons through the coil sets up within it a magnetic field. The air in and around the coil and also the coil former will be in a state of strain caused by this magnetic field. Now a field of magnetic force always momentarily opposes any change in current flow, and as the current through the coil is fluctuating, that is to say, always changing, then the amount of opposition this magnetic field offers is known as the inductance of the coil, and this is measured in henries. The current oscillates at a tremendous rate through the coil to one side of the condenser, and then to the other; it is due to the tremendous speed of these oscillations, and the effect that they produce, that the wireless waves are able to be tuned. The frequency of the alternating currents depends upon the setting of the tuning condenser, *i.e.*, its capacity. That is the reason why the condenser is variable in order to adjust the capacity of the condenser in conjunction with the inductance of the coil, the oscillations of which will then correspond with the oscillations or frequency of the broadcasting station it is desired to listen to; the receiving set can then be said to be in tune with the transmitting station.

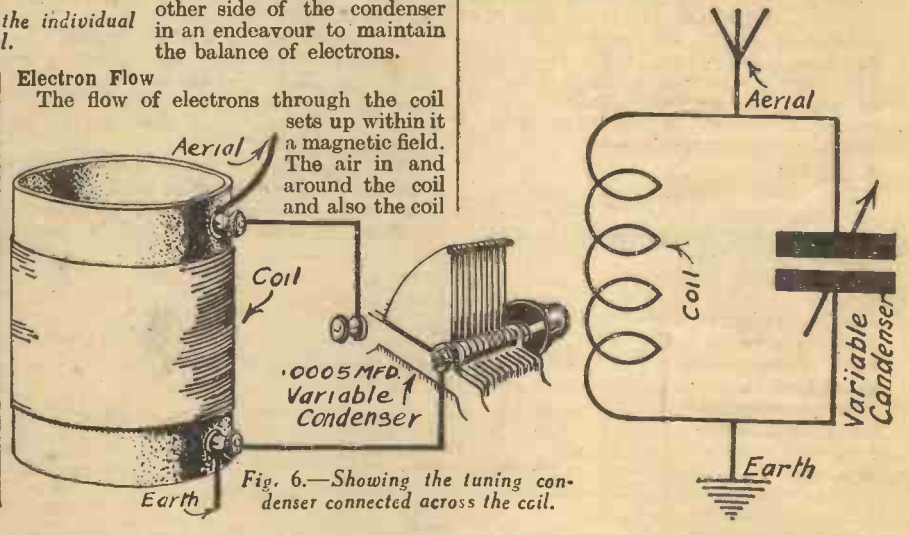
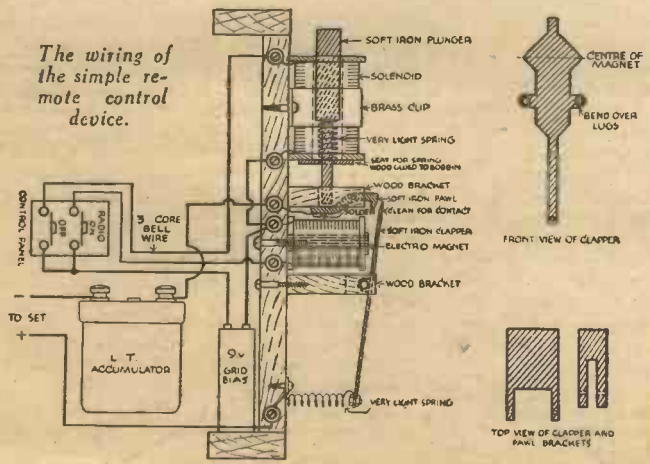


Fig. 6.—Showing the tuning condenser connected across the coil.

REMOTE CONTROL SWITCHING DEVICE

HERE is an idea for switching a set both on and off from anywhere in the house. As will be seen from the sketch, it is a miniature clapper panel with a solenoid for switching off. The materials are easily obtained out of an old bell, a piece of 1/32in. or 1/16in. sheet iron for the clapper and pawl, hard wood or brass for the brackets, a piece of light spring wire, and two bell pushes. The terminals in the sketch are placed for clearness in wiring, but they can be fixed anywhere on the panel. As most of the sizes depend on the size of the bell bobbins, readers will have to make their own sizes. However, the sketches give a fair idea of what is wanted, and the action is as follows.



The wiring of the simple remote control device.

When the "on" push is pressed it energizes the magnet which draws up the clapper. The pawl engages the clapper and holds it, contact being made between the pawl and the clapper, and so switching on the set. When the "off" push is pressed it energizes the solenoid and the plunger hits the tail of the pawl and releases the clapper. The clapper should be very light and the distance between the clapper and the face of the magnet as short as possible. The spring at the foot of the clapper should have practically no tension when the set is off. The lugs on the clapper should be at the point of balance. The nose of the pawl should have a slight downward tendency, but should be easily pushed up by the clapper when the set is switched on. The plunger must be an easy fit in the solenoid, and a touch of the finger on the plunger should lift the nose of the pawl. If the foregoing instructions are adhered to, a 9 volt grid-bias battery should operate the panel for a considerable period, as the current is only on momentarily.

The panel could be fixed close to the set and a three-core bell wire led to anywhere in the house, possibly next to the fireplace. When a "dud" spot comes on in the evening's programme a touch of the button cuts it off and puts it on again without leaving your seat by the fireside. Although the sketch may look rather complicated, the making of the panel should present no difficulty to the average radio constructor, and the remote control business is very fascinating.—WILLIAM LIDDELL (Dalmuir).

HOLDING THE FOREIGNERS—3

Various Methods of Ensuring Consistent Reception of Long-Distance Stations

By

By H. J. BARTON CHAPPLE, Wh.Sch., B.Sc.(Hons.), A.C.G.I., D.I.C., A.M.I.E.E.

IN Part 2 of this series, we discussed the general lines upon which the arrangements for the automatic control of volume, or rather the automatic regulation of the degree of high frequency amplification, should be designed. Several readers have written expressing their interest in this system of control, and avowing their intention of carrying out experiments in this direction. It may assist, therefore, if we go a little further into the practical detail of design, and give a further lead to those who desire a working circuit.

It has already been pointed out that the only really successful method of automatic control for use in sets where only one multi-mu valve is employed, is that involving a separate regulating valve. As receivers with only one high frequency stage are much more numerous than those with many stages, this method of control has been selected for fuller description. The same controlling arrangements can, of course, be applied equally to a set having more than one multi-mu valve or even to a super-heterodyne set.

A Difficulty

The chief difficulty in preparing a practical circuit is, as has been already explained, that the values of the various biasing and voltage dropping resistances depend upon the types and characteristics of the valves used throughout the set. In the accompanying design, therefore, the components are referred to by letter and clear instructions for calculating their values are given.

In order to simplify the diagram a single high-frequency stage is shown. The aerial tuning system is indicated as a conventional tapped coil with variable condenser, and the high frequency coupling as the popular choke-fed tuned grid. The low-frequency side of the receiver and all the refinements such as wave change switching and band pass filters are also omitted for the sake of clarity. It should be made clear, however, that no fundamental change in the control arrangements are necessary when band pass tuning is used.

Referring to the diagram shown as Fig. 1, the multi-mu valve is seen on the left, the detector valve in the centre, and the special regulating or control valve on the right. It will be noted that the grid of the control valve is connected, via the condenser C1, to the grid of the detector valve, so that any radio frequency signal reaching the detector is also applied to the grid of the control valve. The condenser C1 is necessary because, as will appear later, the detector grid is at a considerably higher potential than the control valve grid.

A Resistance Arrangement

The secret of the correct functioning of this arrangement lies in the somewhat alarming arrangement of resistances and condensers shown at the extreme right of the diagram. The resistances A, B and C, in series, are connected between the negative terminal of the high-tension supply and the earth wire of the set. This means that H.T. — is at a lower potential than earth to the extent of the voltage drop across A, B and C.

The cathode of the control valve is connected to the junction of B and C, so that it is at a higher potential than the grid of the same valve. This, of course, is equivalent to a negative bias on the grid, and readers will at once recognise that, if this bias is correctly adjusted, the control valve is in a position to function as an anode bend detector. Any radio frequency signal applied to the grid of the control valve, therefore, will be rectified.

Much of the success of the control scheme depends upon the careful adjustment of the bias resistances A and B so that, unless a signal is actually being received, the anode current of the control valve is zero. The anode supply for the regulating valve is taken from the point E which, we have explained, is at a higher potential than H.T. —. A resistance R4 is included in the anode circuit, and its value must be so chosen that, when the anode current of the control valve is at its maximum, the drop across the resistance is equal to the maximum additional bias it is required to apply to the grid of the high-frequency amplifier. The controlling bias voltage thus produced is fed to the multi-mu valve or valves by way of the smoothing circuit composed of a high frequency choke H.F.C. and a decoupling resistance R5 which are by-passed to earth by the condensers C2, C3 and C4.

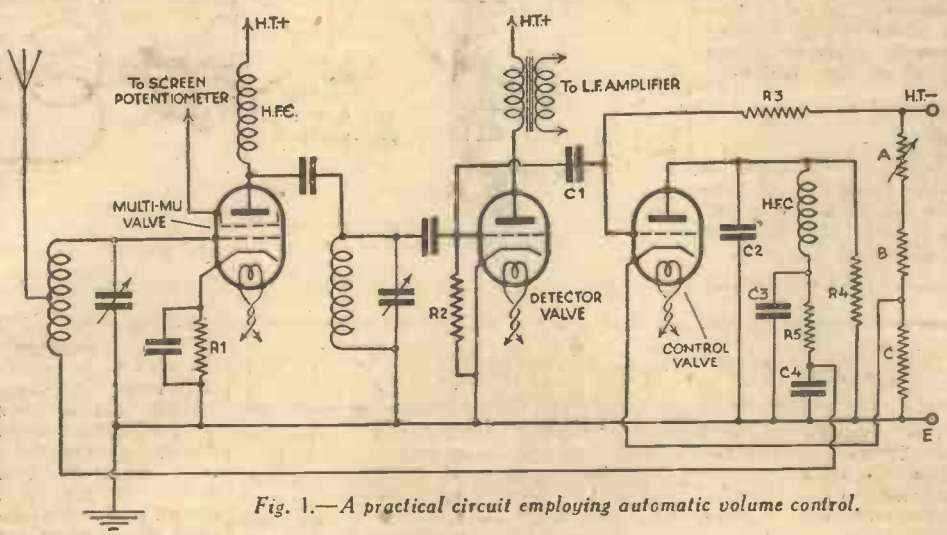


Fig. 1.—A practical circuit employing automatic volume control.

Quantitative Values

We must now turn to the quantitative side of the design, and will begin with the multi-mu stage or stages. It is assumed that in this position one of the usual multi-mu valves of the indirectly-heated type having a total grid base of some 40 volts is being employed. Usually valves of this class require a small permanent negative bias in order to prevent distortion due to grid current when operating at maximum sensitivity, that is to say when no controlling bias is being applied. This bias is provided in the usual way by a resistance R1 in the cathode connection. Its value is invariably given in the data supplied by the valve maker, and usually it is of the order of 200 or 300 ohms. Passing to the detector stage there is little which calls for special comment. The detector is of the usual leaky grid variety, R2 being the normal grid leak. The isolating condenser C1 between the grids of the detector valve and control valve may be fairly large—say .001 mfd. to .002 mfd. or thereabouts. Its value is not critical, neither is that of the grid leak R3, which may be of the order of 1 megohm or less. For the control valve itself, an indirectly-heated triode of the detector or L.F. type should be selected, such as the 164 V, M.H.L.4-C, 41MLF, or other type having similar characteristics.

The chief difficulty in the design is to arrive at the correct values for the resistances A, B and C. It will be necessary to provide about 60 volts for the anode of the control valve, so the first calculation must be that giving the total value of the three resistances in series, *i.e.*, the value of A B C. It is clear that these resistances will have to carry the total anode current of the whole set, so the first step is to find out the value of this current, which we will call "I." It can be found by adding together the anode current of the output valve, the detector valve and the multi-mu valve or valves, not forgetting to make due allowance for the screen currents of the multi-mu valves and the auxiliary grid current of the output valve if this happens to be a pentode. The "standing current" of the screen potentiometer must also be taken into account.

Having found the total current in A, B and C, the combined value of their

(*Continued on page 882.*)

resistance can be calculated in the usual way :—

Resistance (ohms)=60 (volts) multiplied by 1,000 and divided by I (milliamperes).

Splitting up the Resistance

The value of resistance **B** has next to be determined. It must be such that the voltage drop across it is equal to the normal bias required by the control valve when operated as an anode bend detector with an anode voltage of approximately 60 volts. About 2½ volts will usually be about right, and the calculation is made on the same formula as that just given, but using 2½ volts instead of 60 in the first term. Resistance A is intended to give a range of adjustment of the grid bias to the control valve so that the accurate adjustment of its working conditions can be made, and also to permit the point at which control starts to be pre-determined.

Its value should be approximately twice that of B.

In order to save a certain amount of calculation the table which follows gives values for A, B and C for various values of total high tension current. The figures are approximate to enable standard resistances to be employed.

Total high tension current (mA.)	A (ohms)	B (ohms)	C (ohms)
30	150	75	2,000
40	150	75	1,500
50	100	50	1,200
60	100	50	1,000

It must not be forgotten that these resistances will have to carry continuously the full high tension current of the set, so that they must be of the wire wound type of ample rating, resistors of the 5-watt type being indicated for C and of the 1-watt type for B. Resistance A should be of the wire wound variable type. Those who have the facilities for doing so may like to construct their own resistances, in which case a commercial rheostat might be employed for A, while B and C could be combined in one home-made unit with suitable adjustable clips by means of which the tapping for the control valve cathode and also for grid bias for the output valve can be taken off.

Preventing Feed Back

Because the anode current of the control valve is a rectified radio frequency current, and not a steady direct current, care must be taken to prevent any radio frequency component being fed back to the high frequency stage via the control bias circuits. The precautions indicated in the diagram are the high frequency choke, which may be of any good make, and the de-coupling resistance R5 which may be a grid leak of half megohm or more. The bypass condensers C2, C3 and C4 should be of the order of .5 mfd. and of the non-inductive type.

These few notes will provide the basis for some very interesting and instructive experiments. One or two small points can be added. In view of the 60 volts difference in potential between the cathode of the control valve and the cathodes of the multi-mu and detector valves, it is advisable to supply the heater current for the control valve from a separate 4-volt winding. The value of R4, across which the controlling bias voltage is developed depends largely upon the amount of bias it is required to apply. For the normal A.C. multi-mu valve a resistor of about 15,000 ohms will be about right. If the experimenter has a spare potentiometer of approximately this value, or, say, up to 20,000 ohms or so, he might employ this temporarily in order to ascertain the best value.

FROM HERE AND THERE

A Night In Montmartre

IF you wish to visit the Paris night haunts without leaving your armchair, tune in to Beromünster or to one of the French State transmitters on the evening of Tuesday, February 14th. You will be offered a typical programme of cabaret items by singers from some of the most popular night restaurants and clubs in the French capital.

Ultra-Short Waves

TEST transmissions on ultra-short waves in the neighbourhood of 5 metres are being carried out by the Post Office authorities between Weston and Cardiff; across the mouth of the Severn. The results have proved so satisfactory that a regular service will shortly be organized, as these transmissions can replace the existing landlines over a distance of forty-five miles.

Alternative Programmes for Berlin

UNTIL recently the Königs Wusterhausen high-power transmitter was used during the day for the broadcast of educational courses and lectures: entertainments relayed from Berlin and provincial centres were only transmitted after 7.30 p.m. In future, an entirely different programme will be available on this channel. The call has been altered to "*Hier Deutschlandsender Königs Wusterhausen*," and is no longer coupled with that of Berlin.

Copenhagen on the Short Waves

THE Danish transmissions usually heard through Kalundborg may be picked up almost nightly on 31.51 metres through OXY, Skamleback, a 500-watt short-wave station which relays the Copenhagen programmes. The opening signal consists of a short musical box melody in the form of tinkling bells. *Kobenhavn, Kalundborg og Danmark's Kortbolge sender* is the call you will hear between items in the entertainment.

Operatic Performances and Radio Broadcasts

THE Berlin Broadcasting station, following a series of tests, has succeeded in obtaining almost perfect results in the relay of performances from the Opera House. This has been secured by a complete alteration in the microphone installation. Pick-up units are placed in the wings, as well as on the front of the stage. In this manner it is no longer necessary to find room for a large number of the chorus on the stage. Their voices passing through amplifiers can be blended with those of the singers. Loud-speakers in the auditorium combine the sounds picked up from both stage and wings, thus obviating any risk of the singer's voices being swamped by the orchestra. Further experiments on these lines are being carried out.

RECEIVER IN WALKING STICK.

The daily stroll need not be dull if you take the advice of Herr Alfred Mintus, a Berlin engineer, and adopt his portable radio walking stick, with which he is seen here. The headphones he wears under his hat, the wires of them are fixed to the stick inside which the radio set is cunningly concealed.

New Latvian Station

THE Madona 35-kilowatt transmitter which will eventually replace the Riga station has recently broadcast on various wavelengths. As severe interference has been caused to the Florence transmissions, the wavelength has been temporarily altered to 453.2 metres.

Radio City, New York

THE world's greatest amusement centre barring Coney Island, namely, the Rockefeller centre, which includes a music hall and theatre will not be monopolised by radio alone as originally planned. In view of economic conditions the programmes will include films and side-shows (vaudeville) from which relays are to be made to the transmitters. Listeners to W3XAL, W2XAD, W2XAF, and other short-wave stations will be frequently given an opportunity of hearing excerpts from these performances.

Radio-Paris to Become PTT Transmitter

CONFIRMATION is now to hand that the French State is taking over the Radio-Paris high-power station at Essarts-le-Roi, and that the transfer may take place towards the end of March. According to a French newspaper, although the plant is of recent construction, the PTT engineers may spend a further half-million francs or so in bringing it up to date! It is now fully expected that the Eiffel Tower will shortly suspend its entertainment broadcasts. Further, according to rumours current in Paris, the State authorities are also negotiating for Radio Toulouse, which would then become a Regional transmitter.

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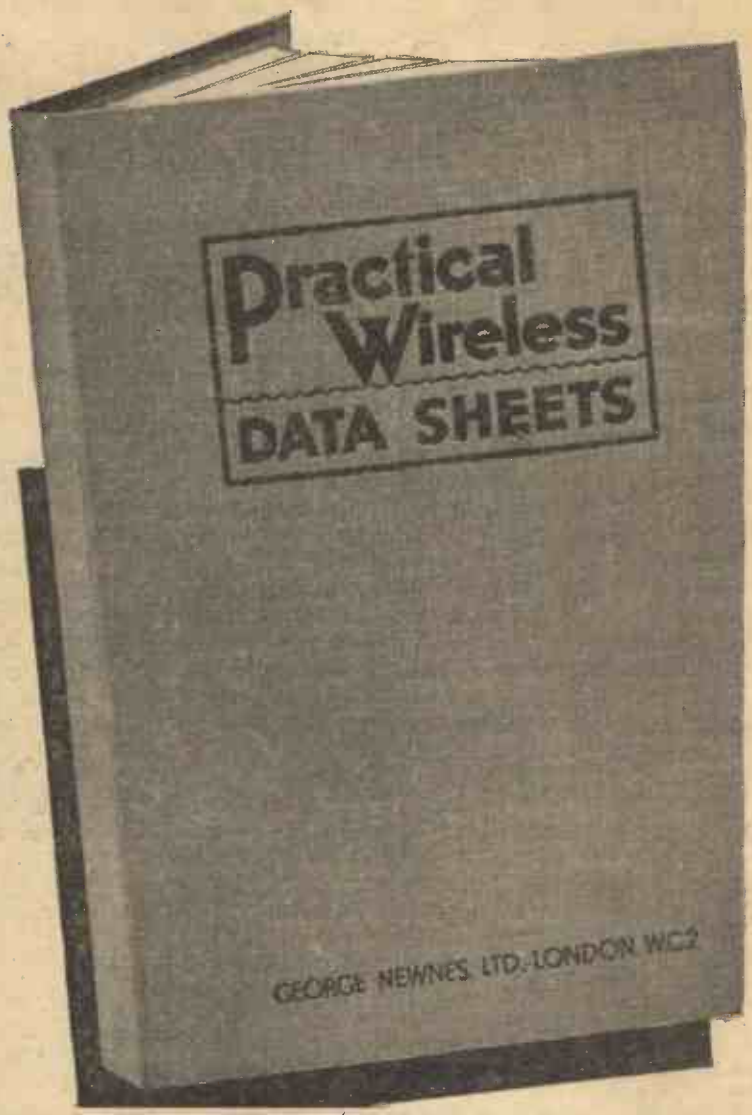

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Data Sheet No. 1—
Accumulator Charging - Dec. 17th, 1932

Data Sheet No. 2—
Coils & Coil Winding - Dec. 24th, 1932

Data Sheet No. 3—
Resistances - - - - Dec. 31st, 1932

Data Sheet No. 4—
Mains Transformers - Jan. 7th, 1933

Data Sheet No. 5—
Wire and Wire Gauge - Jan. 14th, 1933

Data Sheet No. 6—
Chokes, H.F. & L.F. - Jan. 21st, 1933

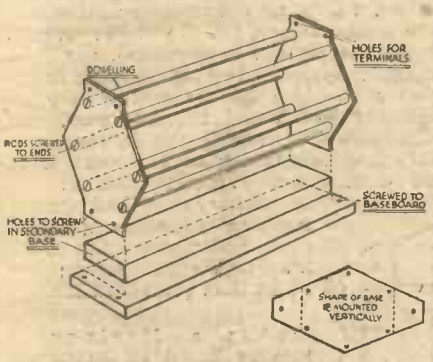
Those new readers who are desirous of completing their files of these Data Sheets may have those already issued for 2d. each from the address given above.

THE HALF-GUINEA PAGE

Radio Wrinkles FROM READERS

Easily-made Coil Formers

USEFUL coil formers can be made of wood, as shown in the accompanying sketch. The ends are hexagonal in shape and arranged to give the required diameter. At each of the six corners is screwed a length of dowelling rod which can

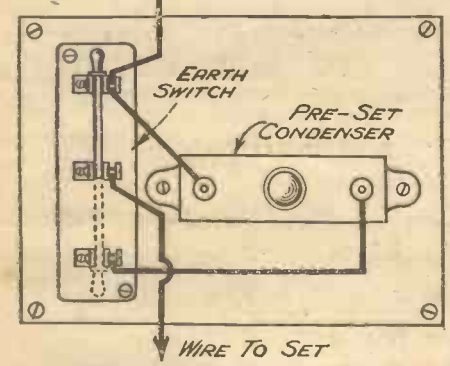


Useful coil formers made of wood.

be purchased cheaply from any woodworkers' store, and these are screwed to the ends, care being taken to prevent the rod splitting. When the parts are ready to put together it is better to soak them all for a few minutes in melted paraffin wax. If the coil is to be fitted horizontally the ends are cut as shown in the sketch, and the top portion used for mounting the terminals. If the coil is to be fitted vertically the base is better if shaped as depicted.—J. G. BRACK (Sunderland).

A Simple Selectivity Device

I HAVE found this dodge quite useful, when reception is very good, to cut out unwanted stations. When the switch is in the position shown in diagram, condenser is out of circuit, but when in reverse dotted position, as shown by lines, condenser is in use and can be adjusted to suit requirements. The whole is screwed on ebonite or any wood painted a suitable colour.—T. BOSTOCK (Blidworth).

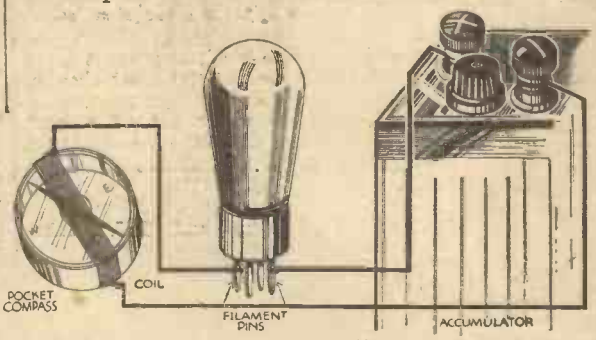


An easily-made selectivity device.

Testing Valve Filaments

IF your receiver fails suddenly for an unknown reason, it is advisable to make certain first of all that the valve filaments are sound. Many of the valves in common use nowadays are equipped with filaments which emit no visible glow when they are switched on, so that it is impossible to tell, by visual examination, whether a filament has burnt out or not.

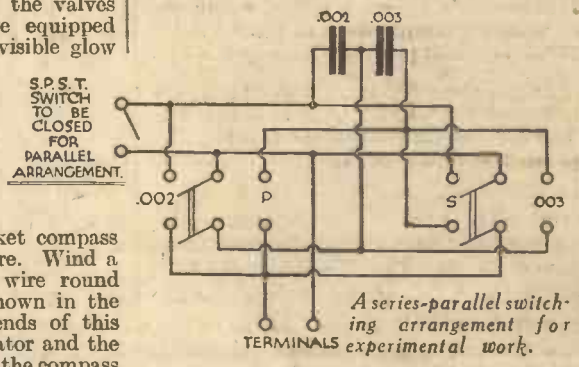
A simple test with an easily-constructed instrument will tell you what you want to know. All you need is a pocket compass and a few feet of insulated wire. Wind a dozen or more turns of the wire round the compass in the manner shown in the illustration and connect the ends of this coil in series with the accumulator and the filament pins of the valve. Put the compass on the bench and set it so that the needle lies parallel with the turns of the coil. A sound filament will be revealed by a deflection of the compass needle as soon as the circuit is completed. Break the circuit, and the needle will swing back to its original position. If the valve filament has burnt out, the needle will not move at all. You can use this instrument, which is really a simple form of galvanometer, or current-indicating device, to test the continuity of any circuit of low resistance.—A. V. D. HORT (Wembley).



Using a compass for testing valve filaments.

Series Parallel Switching

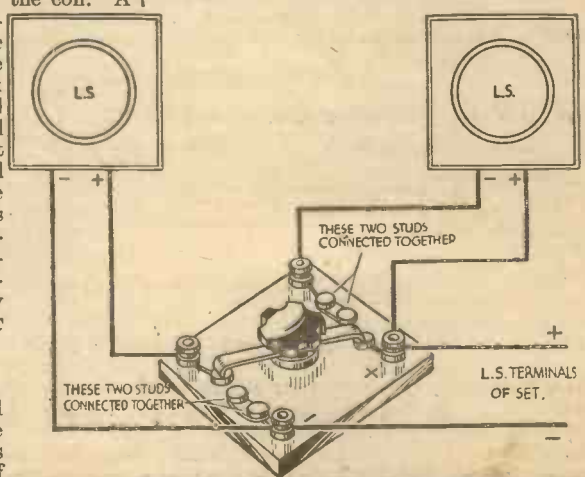
HERE is a simple method whereby more use can be made of any two condensers for quick changing over of values for experimental use and smoothing chokes, tone controls, etc. As will be seen, it is merely a switching arrangement to give the individual capacities, or a series or parallel arrangement to increase or decrease the individual capacities. I have found this arrangement very useful as a tone control, a smoothing choke, or for any purpose where a quick change over from one value to another is desirable without the trouble of disconnections. The two condensers chosen will, of course, depend upon the different capacities desired for the particular purpose in view.—B. M. (Teddington).



A series-parallel switching arrangement for experimental work.

Loud-speaker Switch

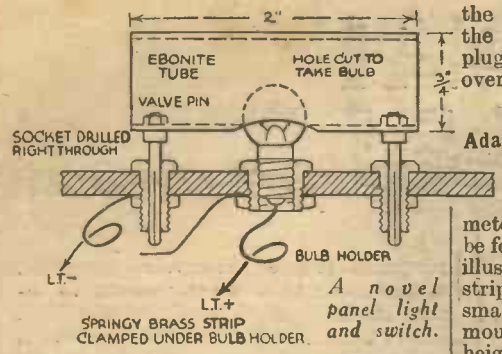
THE diagram below shows a simple switch which I have made to control two loud-speakers in different rooms so that I can use either speaker separately or both together by the simple action of turning one knob. It is made out of a small piece of ebonite about 2in. square, with six contact studs arranged in a circle at equal distances apart. A contact blade is then fixed to a revolving knob in the centre to give the connections needed. The sketch shown will make the arrangement clear.—R. LEWIS (Thornton Heath).



Switch for controlling two loud speakers.

THAT DODGE OF YOURS!

Every reader of "PRACTICAL WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? For every item published on this page we will pay half a guinea. The latest batch is published below. Turn that idea of yours to account by sending it in to us, addressed to the Editor, "PRACTICAL WIRELESS," George Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be *original*. Mark envelopes "Radio Wrinkles."



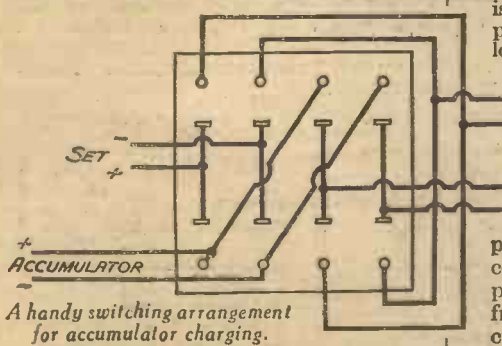
A novel panel light and switch.

A Novel Panel Lighting Arrangement

MANY of those innocent-looking little flash-lamp bulbs, as used for panel lighting, consume quite an extraordinary amount of current, and in view of this fact it is rather convenient to be able to switch the light off after tuning adjustments are completed. The arrangement described here is simple, effective, and cheap in use, as well as adding a touch of dignity to the panel itself, and incorporates an on-off switching arrangement. The reflector consists of a piece of ebonite tubing about 2in. long and ¾in. diameter. A hole is cut to take the flash-lamp bulb, which is mounted directly on the panel between the tuning controls. Two valve pins are mounted on the reflector, and two sockets (one of which must be drilled right through) are mounted on the panel in line with the bulb, and, obviously, the same distance apart as the pins. A piece of thin brass strip is fixed under the bulb holder, as shown in sketch, and the panel light is complete. By slight downward pressure on the reflector tube, the valve pin engages with the brass strip, and the bulb lights. On raising the reflector the circuit is broken.—W. C. LAKE (Aboukir, Egypt).

Accumulator Charging Switch

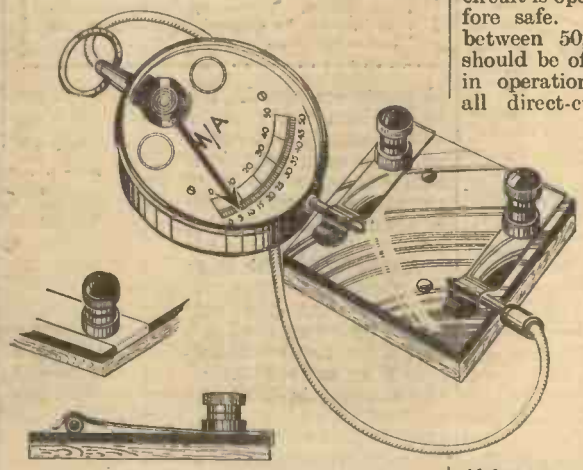
A VERY useful switching arrangement which will be of great convenience to those who charge their accumulators from D.C. mains, using as a resistance a lamp used for ordinary lighting purposes, can be obtained from a four-pole double throw switch, which may be either of the rotary or lever type. The connections should be made as shown on the accompanying diagram, which should be followed carefully to ensure correct polarity. When wired up, it enables one to make permanent connections to the set, mains and two accumulators. By throwing over the switch, the accumulator which was on charge is connected to the set, and the one which was connected to the set is put on charge. Further, the accumulator is charging whenever the light is on, whether the set is on or off, and the set will work, whether the light is on or off. This saves putting the room in darkness or using a shorting plug when an accumulator wants changing over.—WALTER H. STEAN (London, N.).



A handy switching arrangement for accumulator charging.

Adaptor for a Pocket-Meter

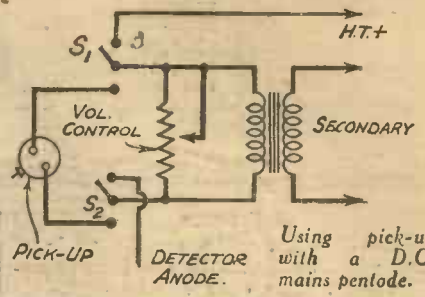
WHERE readings have to be taken in a confined space, so that the pointed terminal ends of pocket test meters prove inadequate, this adaptor will be found useful. Two spring clips, shaped as illustrated, are made from springy brass strip, and mounted under terminals on a small ebonite block, which, in turn, is mounted on a wooden one, the combined height of the two being equal to the distance from the back of the meter to the back of the pointed terminal end mounted at its base. The clips have their ends bent over the edge of the ebonite block to prevent them from swivelling on the terminal shanks. The terminal ends of the meter can now be held quite firmly under the clips, and connections taken from the terminals on the block.—T. W. WILLIAMS (London, N.19).



Useful adaptor clips for a pocket-meter.

Gramophone Pick-up and D.C. Mains Receiver

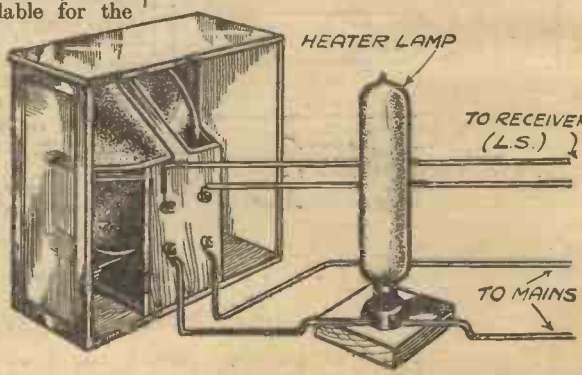
WHEN using a pick-up with amplifiers incorporating D.C. mains pentodes it is found that ample output for domestic purposes is obtainable using no previous low frequency amplifying valve. The Marconi-Osram pentode D.P.T. has been found very satisfactory used in this manner, the coupling between pick-up and pentode being a 3½-1 inter-valve transformer, which is generally available for the purpose. When used in the conventional manner the pick-up must be isolated from the grid and cathode circuits of the receiver by large and reliable condensers to avoid all possibility of shock. Using the present scheme, this may be avoided, and a single volume control may be made to function with both radio and record. The sole piece of apparatus required in addition to pick-up and volume control is a double-pole double throw rotary switch. The circuit proposed is shown herewith, and variations to suit other receivers in which a parallel-fed or auto-transformer is used will suggest themselves. S_1, S_2, are the separate members of the ganged switch, and it will be seen that when the pick-up is connected, the H.T. circuit is opened in two places, and is therefore safe. The volume control may be between 50,000 and 250,000 ohms, and should be of high quality to ensure silence in operation. Owing to the removal of all direct-current magnetisation of the transformer core, the frequency response on the gramophone is good, and reproduction of the lower register particularly so.—F. BUTLER (Stamford Hill).



Using pick-up with a D.C. mains pentode.

Working a Moving-coil Speaker Direct off D.C. Mains

MANY of the early types of moving-coil loud-speakers were fitted with a field coil designed to work off a low voltage, usually 6 to 10 volts, the same low-tension accumulator supplying both loud-speaker and valve filaments. Although most modern moving-coil speakers are suitable for working off electric mains, there must be a great many people who still have one of the low-voltage types, working it from an accumulator, with the inevitable heavy drain, usually half an ampère to one ampère. Now it is often not realized that these 6-10 volt speakers are perfectly suitable for working direct off D.C. mains. All that it is necessary to do is to connect the mains direct to the field coil terminals, inserting in one of the leads a suitable lamp as a resistance. A 250-watt heater lamp will usually be quite suitable, with the added convenience that it will fit the ordinary bayonet holder. This is really an excellent method of working these speakers because the field coil gets its full legitimate current without variation and the speaker will thus be working at its full sensitivity.—A. L. CURRY (Ipswich).



Method of operating a moving-coil speaker direct from D.C. mains.

ALL ABOUT YOUR RADIO BATTERIES

RADIO batteries may be divided into two broad classifications, primary batteries and secondary batteries, or accumulators. Primary batteries are usually of the "dry" type, although the "wet" pattern is in successful use, more particularly for high tension work. Let us take the primary battery first, and by learning something of its working principles, obtain better, and more economical results in our radio practice.

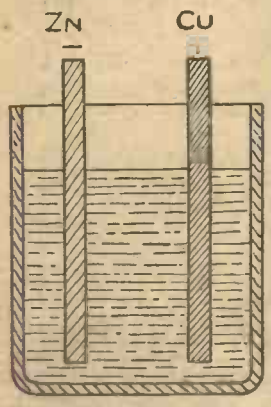


Fig. 1.—Diagram explaining the function of a primary cell.

Strictly speaking the term "dry" is a misnomer as if the cell were really dry, no current would be forthcoming. The proper term would be non-liquid, as the electrolyte, or exciting fluid, is held in paste form by a suitable absorbent material. In construction the dry battery follows very closely the principles of the original Leclanché cell. Here a notable advance in construction appeared in the use of manganese dioxide as a "depolarizer" or recuperant.

To grasp the value of such a feature, let us examine the working of a primary cell, and see what the depolarizer does. In Fig. 1, we have a jar containing dilute sulphuric acid in which are the two plates Zn. and Cu., which represent zinc and copper, respectively. This very elementary battery, actually one of the first ever devised, will give a small current at about one volt pressure—*for a limited time only.* And for the following reason. When the circuit is complete bubbles of hydrogen are released at the zinc plate which is at negative potential. These bubbles travel through the acid and attach themselves to the positive, or copper plate, which is normally at positive potential. As soon as this occurs the output of current will fall off rapidly, until it approaches zero at which point the battery is useless as a generator of current. But suppose we can supply the positive plate with oxygen, this will combine with the hydrogen and keep this "polarizing" effect under control. Here then, is the function of a "depolarizer," it keeps the unwanted hydrogen at bay, and whilst its beneficial action continues the battery will provide a useful supply until its elements are expended.

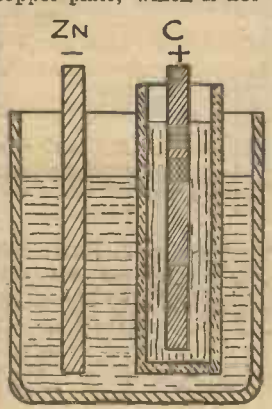


Fig. 2.—Section of a Leclanché cell.

Leclanché Cells

The original Leclanché cell consisted of a jar containing a zinc rod—zinc is always used as the active element in primary cells—and a carbon placed in a cell of porous earthenware. This porous pot also contained crushed carbon and manganese dioxide. The latter being rich in oxygen forms an admirable depolarizer. The electrolyte consisted of a solution of sal ammoniac. Such a battery is well suited for intermittent use as it recuperates after a short spell on open circuit. Fig. 2 gives a sectional view of the make-up of such a battery and brings us to the modern dry cell which is a convenient modification of the old Leclanché battery.

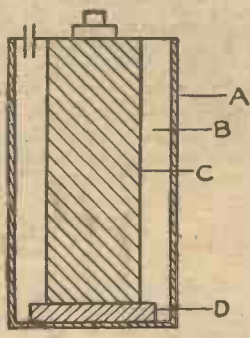


Fig. 3.—Section of a modern dry cell.

We now arrive at the modern dry cell, a section of which is shown at Fig. 3. Here we have the zinc in the form of a cup A, containing an absorbent which holds the excitant B in paste form. This excitant, with certain exceptions, is sal ammoniac—as used in the former Leclanché type—which attacks the zinc and sets up an "electro motive force" or E.M.F. In the centre of the cell, at C, is the carbon rod surrounded by crushed carbon and manganese dioxide much in the same way as in the old Leclanché cell.

At D, is an insulator to avoid short-circuiting the zinc and carbon elements, which are, of course, at opposite potentials, *viz.*, negative and positive.

The top of the container is sealed in by a pitch compound through which is passed a vent tube for the release of the gases evolved during the chemical action. The same vent also allows the entrance of air, the oxygen of which assists in the process of depolarization. Apart from its convenience and unspillability, the dry battery has a much lower internal resistance than the older Leclanché cell. This means that it can supply much larger currents. In fact, a large dry cell can yield 20 amperes or more on a momentary discharge, on short circuit.

A single cell gives an average voltage of 1.5 volts, so that a 120 volt high-tension battery will contain no fewer than 80 cells. These are connected in "series," *i.e.*, carbon to zinc, which gives a total voltage of 1.5 times the number of cells, *e.g.*, 80 x 1.5=120 volts. This being a considerable electrical pressure, it is obvious that no leakage must be permitted, as not only would the cells soon become useless, but excessively noisy in working even over their very short life. It is, therefore, the practice of the battery manufacturer to make the outer container in the form of a crate, or "egg box," made of waxed cardboard, and filled in with paraffin wax. In some of the higher class high-tension batteries, several of the units are further enclosed in insulating capsules to "break" the leakage path at certain critical points.

Proper Care of Batteries

Having now gained some idea of the make-up, also the "whys and wherefores" of our dry battery we can apply the knowledge to useful effect. In the first place we must carefully guard against excessive discharge, and this entails two precautions. Firstly, we must not employ *too small* a battery for our radio receiver, and secondly, we must neither short-circuit the cells nor subject them to an excessive drain when testing their condition. Batteries of "standard," or small, capacity should not be used for sets of more than two or three valves, and taking over 10 milliamperes.

In fact, in practically every case it is a distinct economy to employ batteries of "double" capacity, as the additional life more than compensates for the extra cost. Very cheap batteries of little-known make are dear at any price. These often show a high initial voltage, which falls rapidly and does not recuperate readily on open circuit.

Such a battery has the additional fault of becoming very noisy in action, quite apart from its proneness to cause back coupling where the receiver is not particularly well decoupled.

A good battery will work well right down to nearly half its rated voltage, at which point, say, .8 to .9 volt per cell, its useful life is about ended.

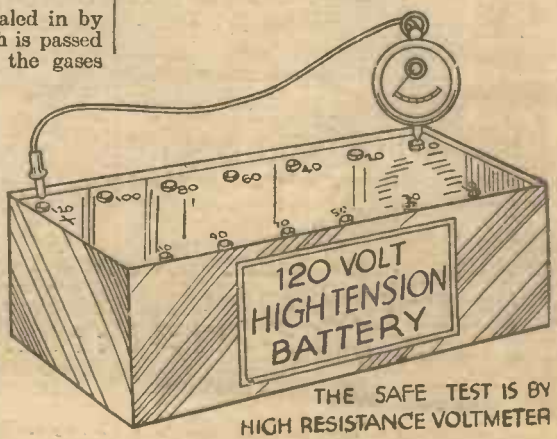


Fig. 4.—Testing a high-tension battery.

Fig. 1A.—*Illustrating an image out of phase.*

PART 7

WHAT IS TELEVISION?

A Short Series Explaining Fundamental Principles.

By
H. J. BARTON CHAPPLE,
Wh.Sch., B.Sc. (Hons.), A.C.G.I., D.I.C., A.M.I.E.E.

IN a short series of articles such as these it is impossible to give more than a brief résumé of television, and such ramifications as Noctovision, Phonovision, Screen Television, Daylight Television, Zone Television, Colour Television, Ultra Short-wave Television, etc., cannot be touched at all. In the previous six articles, however, I have endeavoured to cover the most important points dealing with the working parts of the transmitting and receiving apparatus, in so far as it affects the reader or experimenter. In the concluding one, therefore, I thought it would be interesting to touch on the procedure to be followed when preparing to "look in" at a transmission and using a disc type machine.

"Looker"

By the way, there has been a good deal of controversy concerning the correct term to describe the individual who looks in at a television transmission so that matters will be on a par with "listener," the generally accepted term for the man who sits at home and listens to the programmes provided for him *via* broadcasting. The word that finds the greatest favour, as far as the B.B.C. is concerned, is "looker." I wonder what readers of PRACTICAL WIRELESS think of this?

Fig. 2.—*Adjusting the speed control of the motor driving the television receiver disc while looking in.*

Obviously, the first thing to do is to tune in the London National Station on 261 metres, as this is the transmitter at present furnishing the B.B.C. television signals. These signals should be heard on the loudspeaker, and can be recognized easily as what may be described as a high-pitched steady note, with another high-pitched chirrup superimposed upon it. Once tuned in, change over the output connections on the set so that they feed the vision apparatus—neon lamp and synchronizing mechanism, if this latter has been included.

Fig. 1B.—*Illustrating an image out of frame.*

Starting Up

It is not felt advisable to deal with the several methods by which the wiring between the vision apparatus and wireless receiver can be affected. Everything depends upon the type of output circuit in the set, that is, whether it is direct, choke, or transformer-coupled, together with the amount of voltage available from the source of high tension. This can be dealt with at a later date, when it is hoped to describe practical apparatus for the home constructor.

Start up the vision apparatus motor, noting first of all that the neon lamp is glowing at its normal brilliancy. As the disc gathers in speed a glance into the magnifying lens will reveal a number of oblique black lines and streaks intermingled with red patches. This is the image gradually taking shape, and as the disc speed more nearly approaches its correct value of 750 revolutions per minute, a succession of images can then be seen to be moving *downwards* rather rapidly and it is necessary to adjust the motor speed until the black lines which appear normally at the top and bottom of the picture are horizontal. It is a great help, in working the apparatus to remember that the lines, when sweeping downwards, signify that the motor is running too slow, while when the lines sweep upwards, this will indicate that the motor is running too fast. In either case, the procedure to rectify matters is quite obvious, that is, increase or decrease motor speed by means of the knob provided.

Fig. 3.—*Showing how an image will look when correctly phased and framed.*

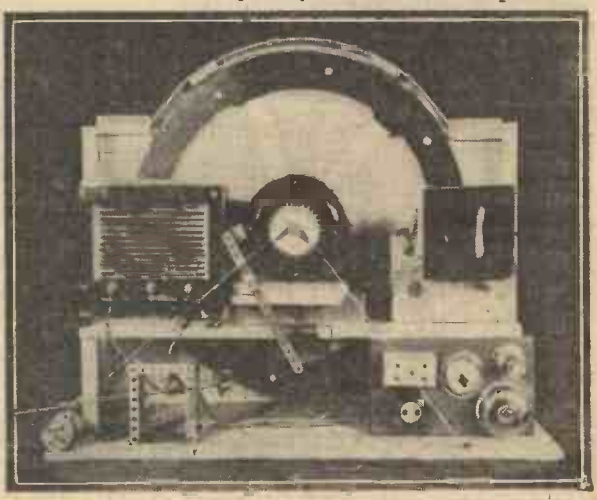


Fig. 4.—*A home-made version of vision apparatus having an ingenious method of friction brake speed control.*

Curious Effects

When the speed has been correctly adjusted, the synchronizing mechanism will come into play and hold the image steady, but if the adjustments are not correct, the image will "hunt" vertically, that is, move up and down and give one the impression of watching a scene through the porthole of a ship as it gently rides the waves. Correctly operated, however, the image can be kept steady, but the image may, when it first comes to rest, be "split vertically," somewhat in the manner indicated in Fig. 1, where two portions of a picture can be seen side by side. This is explained quite simply, and arises from the fact that the disc has been pulled into a state of isochronism (see last week's article), and true synchronism is not established, since corresponding disc holes or scanning areas at the transmitting and receiving ends are not in phase. The image is, in effect, moved bodily along to the left or to the right by the number of holes it is out of phase.

Rectifying Matters

To rectify matters with the ordinary apparatus, *gently* bring the disc from its correct speed by adjusting the resistance control. The image will drift slowly upwards or downwards, and as soon as the double image has resolved itself into a single one, the motor speed must be readjusted to normal again. These synchronizing adjustments have to be done intelligently, but a little practice will soon put this right, just as is the case when tuning a new set.

In Fig. 1 is shown another possible occurrence, this being known technically as an image "out of frame." It arises when automatic synchronizing or synchronous motors are employed, and is due to the mechanism being set incorrectly with reference to the disc holes. If no other device is available, it will be necessary to move round slightly the disc on the shaft, but the better and simpler alternative is to rotate either the whole carcase of the motor or adjust the position of the field coils by moving them a little round the motor carcase.

Interesting Records

The photograph indicated as Fig. 2 is interesting, inasmuch as it shows a "looker" making adjustments to the speed control of an experimental Baird "televisor" used in Germany in 1929. The image here was quite small, and appeared in the aperture seen on the right of the square front cabinet. In addition, Fig. 3 will show the reader how the image will appear in his apparatus when properly phased and framed. The machine shown is one which was built by the German company, Fernseh A.G., and is designed for horizontal scanning, with a resultant picture shape differing from the English standard.

Fig. 4 records an amateur effort at building disc television receiving apparatus and is included to show the ingenuity displayed by constructors to obtain correct speed regulation. A remote control friction brake will be noticed, this apparently being preferred to the more usual electrical methods, but by all accounts it functioned to the satisfaction of the user, and after all, that is the main criterion.

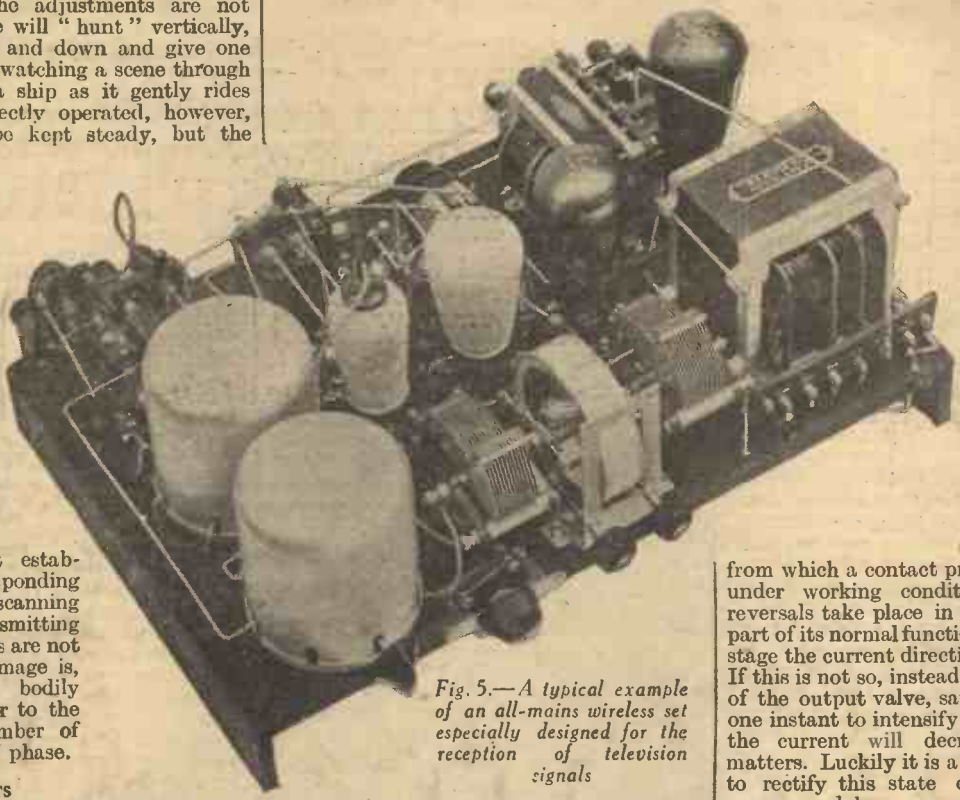


Fig. 5.—A typical example of an all-mains wireless set especially designed for the reception of television signals

The Television Wireless Set

Just a word now in connection with a wireless set to be used for the reception of the television signals. Here again is a case where individual taste can be exploited provided one or two points are borne in mind. First of all, do not forget that the absence or over accentuation of certain frequencies as a result of suppression or resonance in the wireless set, will quite easily spoil the image. The lower frequencies are responsible for the pictorial or pleasing effects, and if the set fails to go down to the "bass" notes it will no doubt be found that there is a kind of white light thrown up behind a person's head in the case of a close up image. In addition, the white background becomes almost black on the top of the image on either side, while the observer will notice beard-like shadows which have the effect of making the image look dirty.

On the other hand, if the higher frequencies are cut off there will be an absence of detail. The eye, for example, will look somewhat blurred or out of focus and too much imagination is required to get a true mental picture of the subject being transmitted.

From these remarks it will be gathered that the wireless set must be as free from distortion as possible. Tuning circuits, in consequence, must not be too sharp or ultra selective, otherwise we can say goodbye to the high frequencies, while at the other end of the scale do not have a rapidly falling response curve in the low frequency amplifier, or there will be a feeling of disappointment with the results obtained.

Negative Images

Another point to watch comes about from current direction. In aural reception no account has to be taken of this as far as the operation of the loud-speaker is concerned. A reversal of current direction in television reception will change a positive image (that is, one in which there are the true light and shade relationships as in an ordinary photograph) into a negative one (that is, an image which resembles the photographic plate from which a contact print is made). Since under working conditions these current reversals take place in the wireless set as part of its normal functioning, at the output stage the current direction must be correct. If this is not so, instead of the plate current of the output valve, say, increasing at any one instant to intensify the neon lamp glow, the current will decrease and reverse matters. Luckily it is a relatively easy task to rectify this state of affairs when it occurs, and here are one or two ways of doing it.

If a transformer precedes the last valve, reverse *either* the primary or secondary connections to the windings. In many cases it is quite sufficient to reverse or interchange the connections on the output terminals of the set, while another stage of low-frequency coupling can be added, or a change effected in the method of rectification, that is, anode bend to leaky grid or *vice versa*.

A Big Future

As an example of a well-made all mains wireless set for the reception of the television signals, readers should refer to Fig. 5. This is a three valver of medium range and represents quite good practice for this class of work. No doubt at some future date it will be possible to describe to PRACTICAL WIRELESS readers the complete designs of both a television wireless set and also the vision apparatus itself, but in the meantime may I enjoin every one of you to study carefully the facts which I have endeavoured to present to you in this series as succinctly as possible.

No one can gainsay that television has a big future and in this connection the amateur is an important person. He is the man (and in these enlightened days we can justifiably say woman) who studies every new development, and just as in the early days of wireless he contributed his quota which materially assisted progress, so history can repeat itself as far as the science of television is concerned.

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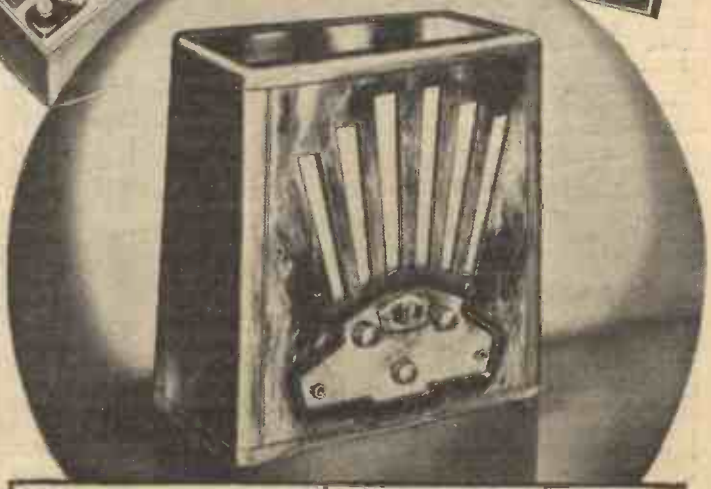

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A FEW WORDS TO THE MANUFACTURER

Little Improvements which are Long Overdue

By W. B. RICHARDSON

Modern Components have Reached a Very High Standard of Performance, but Many Still Suffer from Minor Defects Connected with their Fitting or Operation. The Writer Enumerates Some of These and Suggests How They Might be Remedied.

THERE is no doubt that on the whole home constructors are very well catered for by the trade. There is scarcely a single component or accessory which the amateur is likely to need which cannot be supplied in a variety of makes and styles. However, in spite of this there are still many little grouses to be laid at the feet of manufacturers. These are not grouses about the efficiency of components or their adaptability to modern circuits, for manufacturers have done marvels in these directions, but rather are they complaints which arise from the practical difficulties met with in assembling.

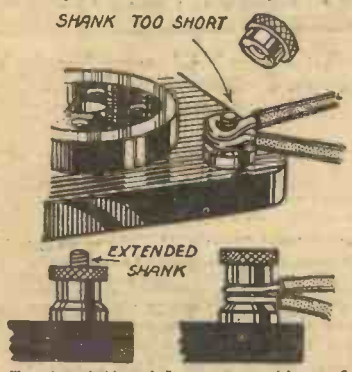


Fig. 1.—(Above) It is impossible to fit more than one wire under some terminals. (Below) A longer shank is all that is required.

Amateur construction or assembly is, of course, fundamentally different from professional construction. For example, a component used in a factory-made receiver can be designed for the one particular set in which it is to be used. The designer knows beforehand the exact characteristics required, so that there is no need to arrange for alternative values, extra tappings, and so on. Moreover, it can be designed to fit in nicely with the other parts so that there is no wasted space, and the connecting tags can be arranged in just the right position to give short and neat wiring.

With home construction, on the other hand, components have to be adaptable to many different circuits and layouts. This means that the general shape, position of terminals, etc., must be such as to suit average needs. We must not therefore be too ready in condemning the manufacturer if a certain part does not happen to fit in with a particular layout, or is a little difficult to connect up. It may be that in a different set it would be ideal. However, in spite of this acknowledged difficulty in meeting *all* requirements, we still have, as I say, several legitimate causes for grousing.

Why Not Standard Screw Threads?

Take terminals, for example. Constructors do not complain for fun. Terminals on many coils, valve holders, etc., are really too miserably inadequate for words. They are small and difficult to get at, and have no locking devices, so that when you attempt to tighten them up they merely go "round and round." All this has been pointed out before, but there are some other difficulties in connection with terminals which I have not seen mentioned before, but which most constructors must have come across at one time or another.

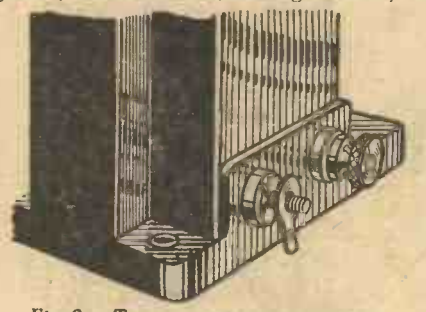


Fig. 2.—Type of soldering tag which is nothing more than a spade terminal. It is not a proper soldering lug.

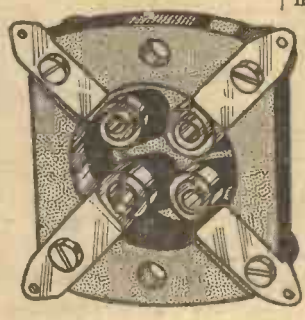


Fig. 3.—An example of a genuine soldering lug. They are made in one piece with the valve sockets.

First of all there seems to be no co-ordination amongst manufacturers regarding the screw threads used; in fact, many seem to delight in producing a thread which is slightly different from any other. The result is that, if a terminal nut is accidentally lost, it is ten to one against our being able to replace it with one from off an old component. No retailer seems to stock replacement nuts, and so we either have to use one which is of the wrong thread, but can be made to "hold," or else do without one—a very unsatisfactory state of affairs.

I suggest that it would be quite simple to use standard threads and to limit them to two sizes, say 4 B.A. as the general size, with 2 B.A. for special purposes such as large aerial and earth or speaker terminals.

Another difficulty with some terminals is that there is not room under the nut for more than one connecting wire. If two wires are joined to the same terminal it is impossible to get the nut on. Of course it only means making the threaded shank a little longer and the problem would be solved. See Fig. 1.

Soldering Lugs

One thing regarding terminals which has always puzzled me is the little spade connector or soldering lugs which some manufacturers slip on to each terminal before putting on the nut. (See Fig. 2.) I have never quite understood whether these are to be considered merely as spade terminals to be soldered to the end of each connecting wire to save making a loop in the wire itself, or whether they are really intended to take the place of soldering lugs. If they are spade terminals, then there should be more than one under each nut, for it often happens that more than one wire has to be connected to one terminal. Anyway, they are certainly not much advantage over the ordinary method of making a loop in the wire since the time saved in making a loop is offset by the necessity for soldering. For this reason most constructors discard them. If on the other hand, they are supposed to be soldering lugs in the ordinary sense of the word, surely they lack the one essential of such a device, namely, the provision of an unbroken metallic contact from the component to the connecting wire. After all, we only solder a wire to a piece of apparatus so as to get direct contact and avoid the possibility of its ever coming loose. This is why the lug on a valve holder,

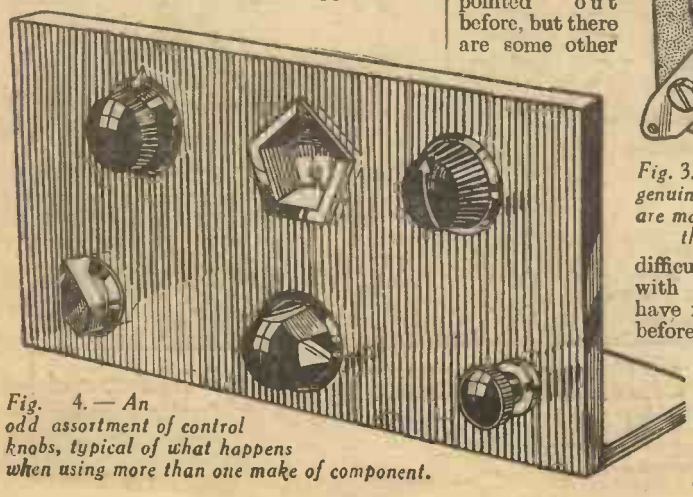


Fig. 4.—An odd assortment of control knobs, typical of what happens when using more than one make of component.

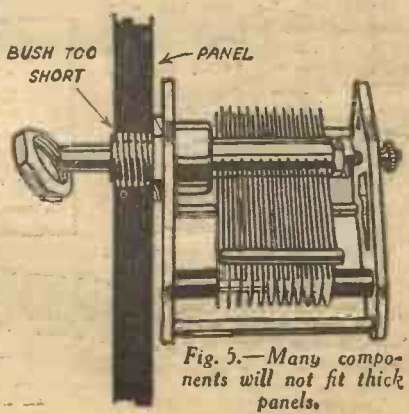


Fig. 5.—Many components will not fit thick panels.

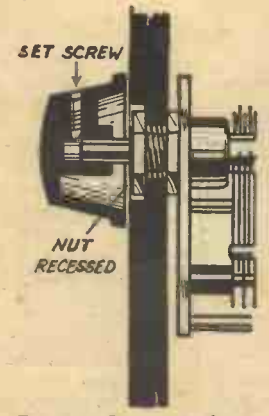


Fig. 6.—Recessing the panel may overcome the difficulty, but sometimes the control knob will not go in far enough for the set screw to hold.

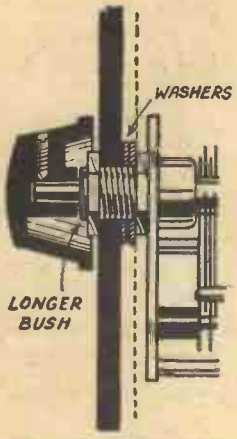


Fig. 7.—A longer bush is all that is needed. Washers could be used with thin panels.

for instance, is often an extension of the metal valve-pin socket itself.

A wire soldered to such a lug is bound to make contact with the valve-pin socket since it is part of it. However, with these soldering tags which fit under the terminal there is no such continuity. They are dependent for their excellence of contact on the tightness of the terminal in the same way as is a looped wire.

Position of Terminals

Regarding the positioning of terminals, most designers make an effort to keep them near the base of components. This is all to the good and makes for neater wiring, especially in the case of chassis-mounting and under-baseboard wiring. There is one little complaint I have to make, however, and that is that some makers put them rather *too* close, so that they almost scrape the baseboard or panel and make it very awkward when wiring up.

With variable resistances and potentiometers of the circular panel mounting type the terminals are usually placed round the edge, as in Fig. 11. This is often done for technical reasons, but one or two makes have them on the face of the instrument. This latter is certainly the most get-at-able position, and I suggest more makers might try to adopt this arrangement in their next designs.

Odd Control Knobs

One way in which home-constructed receivers are often not up to the standard of bought sets is in the appearance of the panel. Whereas the professional set usually has a neat and symmetrical layout with control knobs to match one another, the amateur receiver very often has an odd assortment of knobs. One reader pointed this out in the correspondence columns of this paper only a short while ago, and suggested that there should be greater co-operation between manufacturers, presumably to effect some sort of standardization.

It seems to me that the solution to the problem is very simple. Why not supply components *without* knobs and market the knobs themselves as separate parts? The idea would be to standardize not the pattern of the knobs, but the size of the spindles on which they fit. In this way a number of knobs of the same pattern could be fitted to all the various control spindles on a receiver. When building a set one would first purchase the necessary components and then choose a number of knobs. These would be obtainable in a variety of designs and colours, and all one would have to do would be to choose a complete set all of the same pattern. This might include, say, 2 large tuning dials, 2 smaller ones for volume and reaction controls and 2 knobs for switches.

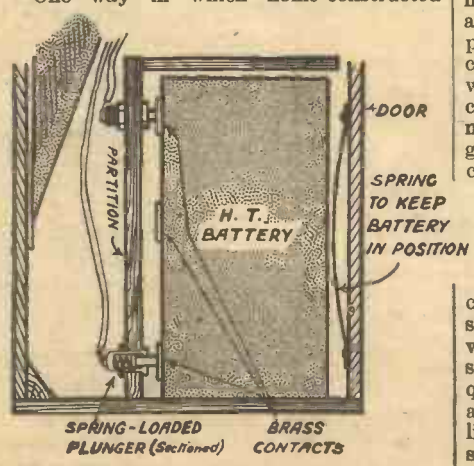


Fig. 10.—How the battery would be used.

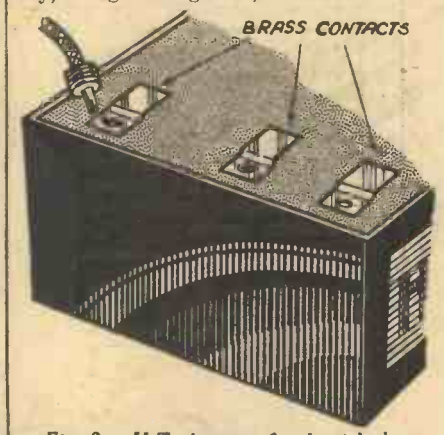


Fig. 9.—H.T. battery fitted with brass contacts as well as sockets (see text).

Stiff Controls

The question of control knobs reminds me that many variable condenser controls are anything but silky in action. This is particularly noticeable with some ganged condensers worked with a disc drive. One would think that any little stiffness in the condenser itself would be reduced to a negligible amount through the reduction gear of the drive; but nevertheless the control is often very heavy and jerky in operation.

On examining one or two models which suffered from this drawback, it appeared that the trouble was primarily due to the main spindle being very stiff. This necessitated the disc drive being very heavily spring loaded in order to turn the dial without slipping. Had the condenser spindle been easy to turn in the first place, quite a light drive would have beensufficient, and so the whole operation would have been lighter and smoother. The cause of the stiffness of the condenser spindle was chiefly the springs which were used to ensure good electrical contact between the spindle and the body of the condenser.

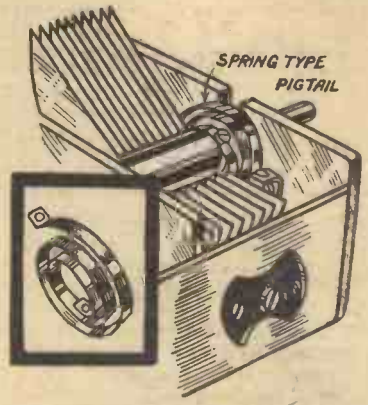


Fig. 8.—Watch spring type of pigtail connector has advantages over the ordinary type. Inset: Details of the spring.

No doubt pigtail connections would solve the problem. If the ordinary type were considered unsatisfactory owing to the possibility of their breaking, scraping on the plates, or varying their positions and so upsetting the ganging, I suggest that pigtails made like watch springs might answer the purpose. I had an old watch spring functioning in this capacity on a reactive tuning unit for many years and it worked admirably. Fig. 8 illustrates the idea as applied to a condenser.

Panel Mounting Difficulties

When it comes to the mounting of variable condensers and similar components on the panels of many home-built receivers another difficulty often crops up—the panel is too thick to allow the nut to go on the threaded bush. See Fig. 5. It seems to be the exception rather than the rule to find a component of the one-hole-fixing type which will fit a panel more than ¼in. thick, and many appear only suitable for 3/16in. panels. The result is that if a thicker panel is used the fixing nut has to be recessed in the panel as in Fig. 6. Even then it is often found that the control knob cannot be secured in position,

All this could be overcome by supplying slightly longer bushes and providing spare washers for use with thin panels. The washers would, of course, be placed behind the panel. This is shown in Fig. 7.

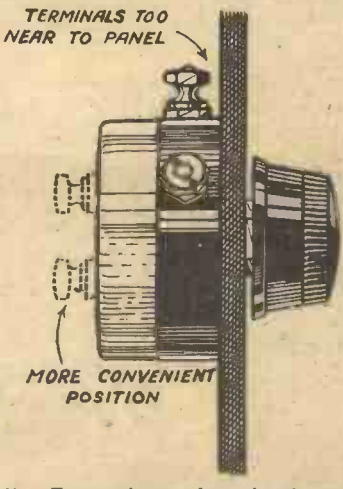


Fig. 11.—Terminals are often placed too near the panel for accessibility. Dotted outline shows a better position for them.

THE NEW RECEIVER WHICH WILL MAKE RADIO HISTORY.

Free 1/- Blueprint will be given with our Issue Dated Feb. 11th, on Sale Feb. 8th.

The Fury

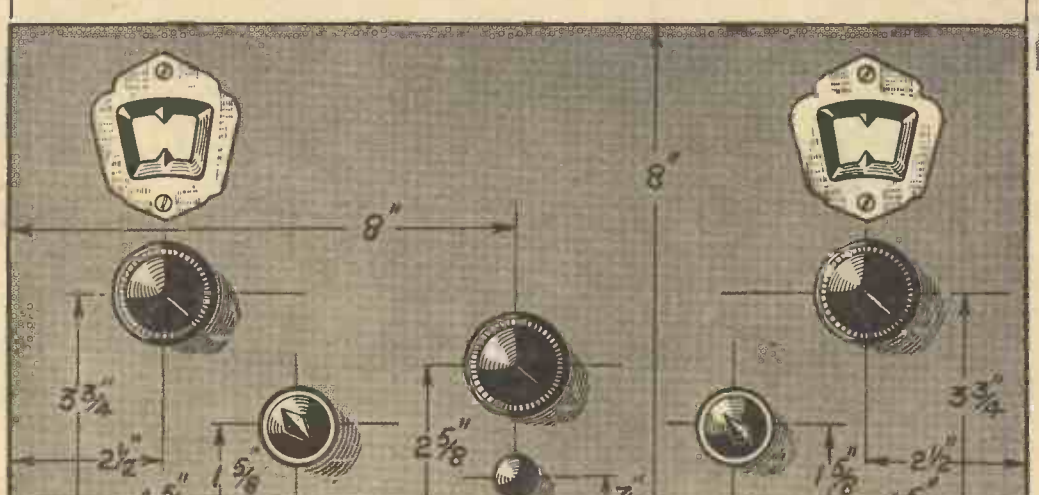
A most remarkable receiver, with a Personal Guarantee of Performance.

LAST week I made an important announcement on page 833 concerning my new four-valve receiver, the "Fury Four." I should like briefly to reiterate for the benefit of those readers who are reading PRACTICAL WIRELESS for the first time that I have specially designed this receiver for the readers of this paper as a result of the hundreds of letters I daily receive concerning the drawbacks and the deficiences of the average home-constructed set. So certain am I of the "Fury Four," that I recommend with every confidence and great enthusiasm, every reader of this paper to make it. Realizing as I did that this is the season when a reader might be tempted to make up a set which would fail to give him the satisfaction and service he requires, my tests of the "Fury Four" have been accelerated by the use of aircraft. I do not wish to use valuable space by reiterating *in extenso* all of the preliminary announcements I made last week, and I will therefore confine my claims to a sentence. They are these: the "Fury Four" is extremely selective; provides ample volume; receives at least one hundred stations on the medium and long wave bands; it is very simple to operate; cheap to build; free from background; economical to run; it is stable; easy to construct; no jamming of stations; most important of all, it is backed by my personal guarantee of satisfaction. Any reader, therefore, who fails to obtain the results of which I know the "Fury Four" to be capable, may avail himself of my personal advice free of charge on any difficulty he may encounter in its construction (excepting queries relating to alterations to suit reader's own components, which in no case can I answer) until the set functions to the satisfaction of the reader. It is necessary for the reader rigidly to adhere to my building and operating instructions. Let us now proceed to an examination of the circuit which is shown at the right-hand corner of this page. As stated above, a full-size wiring diagram of the Fury Four will be given with our issue dated February 11th.

The Circuit

It will be noted from the circuit diagram on this page that I have made use of two screened grid valves to render foreign reception certain. The pre-set aerial condenser C1 ensures that irrespective of the aerial used, the tuning range of the variable condensers will be fairly constant. A point which the reader will appreciate is that only one H.T. tapping is used. You merely plug in the negative wander plug into the negative socket and the single positive H.T. lead into maximum H.T. voltage. I have used voltage dropping resistances to ensure that each valve has the correct voltage applied to its plate. The great advantage of this arrangement is that the varying current-consumption of each valve does not cause high resistance patches to develop in the H.T. battery, which is the common cause of motor boating, instability, and poor reception when multiple H.T. tappings are used.

This illustration shows the extreme simplicity of the Fury Four. Tested in numerous zones noted for their reception difficulties, by many independent radio experts, this receiver has yielded remarkably uniform results.



PANEL LAY-OUT OF THE FURY FOUR.

Here is a r... "Fury Four," ... all sets. ... plicity of the ... wiring ...

MY GU...

I give a personal guarantee of satisf... I claim for it, and every reader ma... my personal advice *free of charge* co... any difficulties which may arise, unt... functions in the same manner as m...

Four

By F. J. CAMM

Every Reader of this Paper should make up this Amazing Receiver, which will easily receive OVER 100 Stations on the Medium and Long Wave-bands.

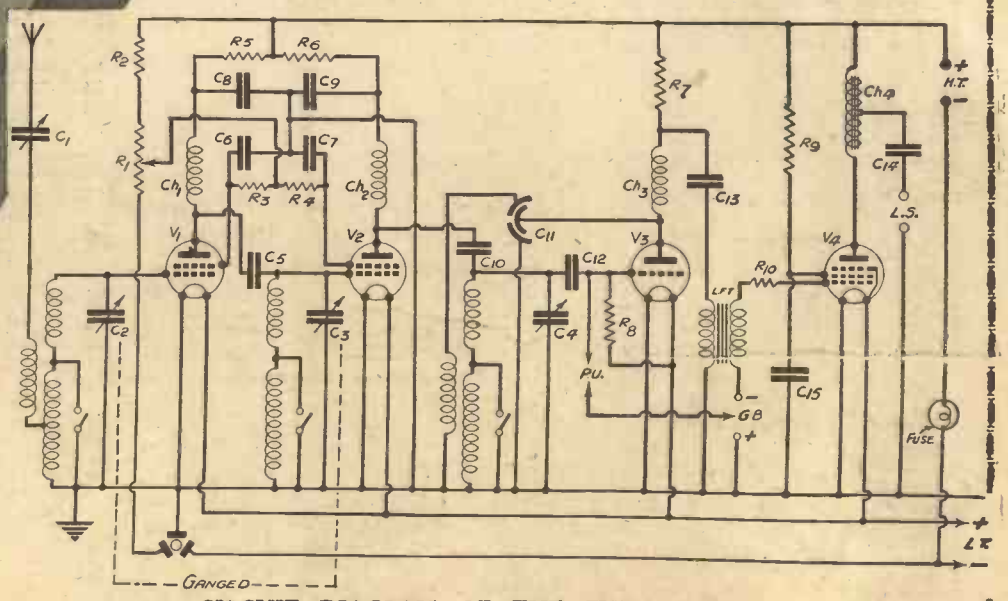
w of the amazing most modern of the extreme sim- out and the easy ngements.

arrangements to save him not only trouble in adjustment, but also money. My main object has been to provide a thoroughly reliable receiver with none of the drawbacks to which the reader has normally become accustomed, and with all of the snags anticipated and remedied, instead of, as is usually the case, the reader being left to do so. I feel that I should explain why I have not used a three-gang condenser in conjunction with the triple-gang coils. The reason is that there is a certain amount of difficulty in accurately balancing three condensers. I have, therefore, saved the constructor the trouble of doing this by tuning the detector grid-coil by a separate .0005 mfd. variable condenser. Therefore, the aerial and first grid circuit are ganged because, as the aerial is always flatly tuned, an accurate ganging does not, as a result, matter. In point of fact, this arrangement in the "Fury Four" yields far better results than the triple-gang condensers which I originally tried. I found that it was possible to facilitate the tuning considerably in this way. It is obvious that the detector grid-circuit is damped by the grid-leak; therefore this circuit is "flat," and a separate tuning condenser may be used here. You need to operate the "Fury Four" to realize the great value of this arrangement. You will notice that all components except one H.F. choke are screened. There is really no need to screen this as all risk of interaction is, of course, removed by the screening of the other components. Quite naturally I have adopted sub-baseboard wiring. Not only does this make for a neater layout and greatly simplify the wiring, but it also enables the condensers, the fuse, the resistances, etc., to be tucked away and hence actually reduces the size of the baseboard which otherwise would be necessary. I have considered the reader's pocket by using special mains condensers for screen grid decoupling purposes, for they are much cheaper than

(Continued on page 896.)

Full logging charts of the Fury Four will be given in later issues, together with independent reports by radio experts. Their reports agree in striking manner.

It will be noted that the detector valve is parallel-fed to the pentode, the one micro-farad condenser being fitted to provide a slight bass resonance to assist in balancing out the shrillness which generally accompanies the use of pentode valves. For the same reason a pentode output-filter is used with a similar value condenser. A point the reader will note in checking over the circuit is the extreme care exercised in choosing values and



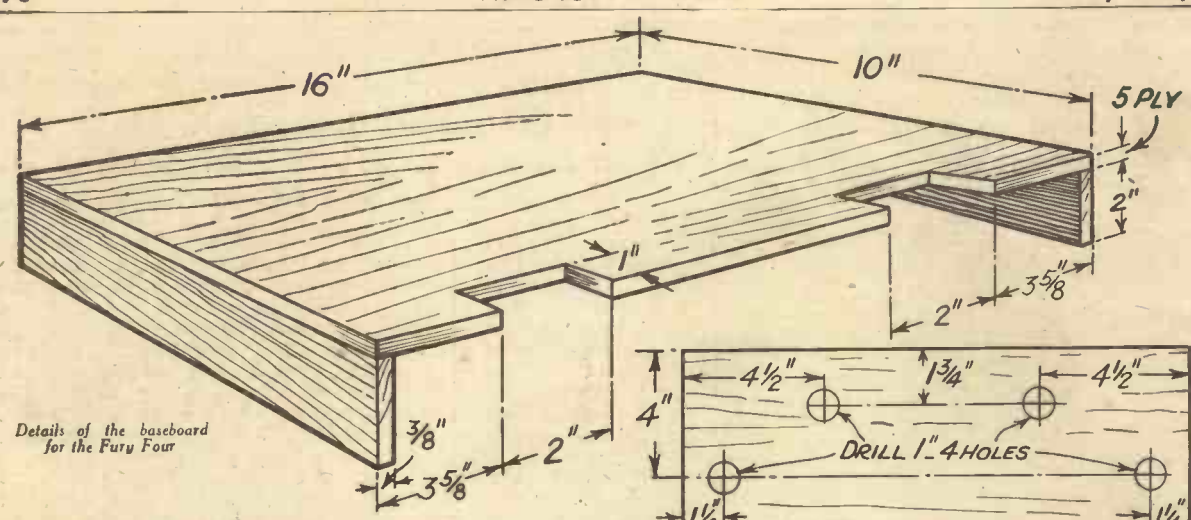
CIRCUIT DIAGRAM OF THE FURY FOUR.

C1, C5, C10—.0003 mfd. C2, C3, C4—.0005 mfd. C6, C7, C8, C9—.1 mfd. C11—.0003 Differential. C12—.0002 mfd. C13, C14, C15—1 mfd. R1—50,000 ohm. Potentiometer. R2, R7—30,000 ohms. R3, R4, R5, R6—1,000 ohms. R8—2 megohms. R9—5,000 ohms. R10—100,000 ohms. Ch1—Screened S.G. Choke. Ch2—Unscreened S.G. Choke. Ch3—Screened Standard H.F. Choke. V1, V2—Metallised 220 S.G. (Cossor). V3—Metallised 210 H.F. (Cossor). V4—220 PT (Cossor).

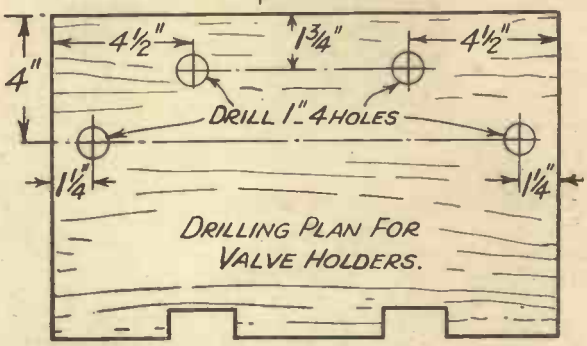
ARANTEE!

faction that the Fury Four will do what y obtain ncerning il the set ine.

F. J. Camm



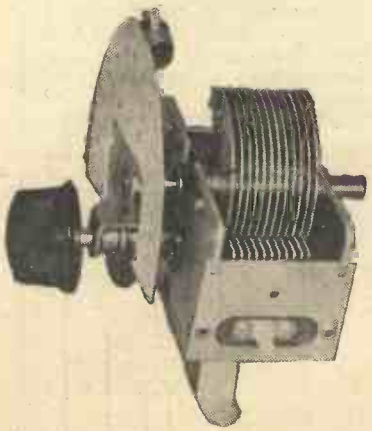
Details of the baseboard for the Fury Four



LIST OF COMPONENTS FOR THE FURY FOUR

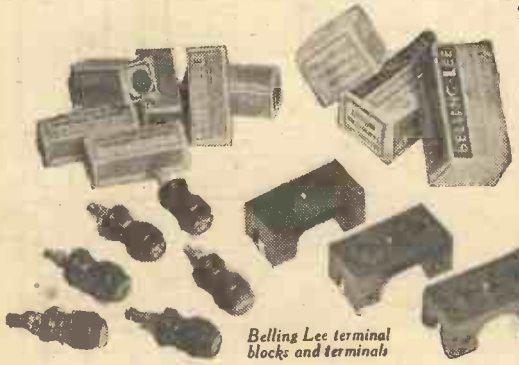
(See Page 897 and below for illustrations of these Components)

One Three Gang LISSEN Coil Assembly (L.N.5162).
One LOTUS Two-gang Condenser with Disc Drive.
One LOTUS .0005 mfd. single Condenser with Disc Drive.
One SOVEREIGN Compression Type Condenser, Type J.
One WEARITE S.G. Choke, Type H.F.P.A.
One BULGIN S.G. Choke, Type H.F.4.
One PETO-SCOTT Screened H.F. Choke.
One READY RADIO L.F. Transformer, Ratio 3 to 1.
One TELSEN Pentode Output Choke, Type W.72.
Three DUBILIER 1 mfd. Fixed Condensers, Type BB.
Two DUBILIER .0003 mfd. Fixed Condensers, Type 665.
One DUBILIER .0002 mfd. Fixed Condenser, Type 665.
Two DUBILIER .1+.1 C mfd. Fixed Condensers, Type BE 31.
Four CLIX Chassis Mounting Valve-holders, Three 4-pin and one 5-pin.
Four 1,000 ohm. ERIE Resistors, 1 Watt Type.
Two 30,000 ohm. ERIE Resistors, 1 Watt Type.
One 100,000 ohm. ERIE Resistors, 1 Watt Type.
One 5,000 ohm. ERIE Resistor, 1 Watt type.
One LISSEN 2 meg. Grid Leak with Wire Ends.
Three BELLING-LEE Terminal Blocks.
One BELLING-LEE 4-way Battery Cord.
Six BELLING-LEE Terminals, marked Aerial, Earth, Pick-up, Pick-up, L.S. and L.S. (Type B).
One BULGIN Fuse-holder, Type F.5 with Fuse.
One LEWCOS 50,000 ohm. Potentiometer.
One TELSEN .0003 mfd. Differential Reaction Condenser, Type W.185.
One WEARITE Three Point Switch, Type GWC.
One Ebonite Panel, 16in. by 8in.—BECOL.
Three CLIX Wander Plugs, GB+ GB 1 and GB 2.
Two COSSOR Valves, Type 220 S.G. (Metallised).
One COSSOR Valve, Type 210H.F. (Metallised).
One COSSOR Valve, Type 220 PT.
One EDISWAN 2-volt Accumulator.
One EDISWAN 9-volt Grid Bias Battery.
One EDISWAN 120-volt Super Capacity H.T. Battery.
One W.B. Loud Speaker, Type P.M.4.
One CARRINGTON Fury Four Cabinet.
Two coils of GLAZITE Connecting Wire.
Sundry Screws, soldering tags, etc.

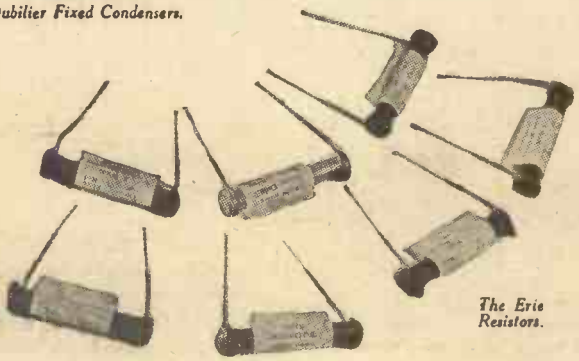


The Lotus single .0005 mfd. Condenser with Disc Drive

The Dubilier Fixed Condensers.



Belling Lee terminal blocks and terminals



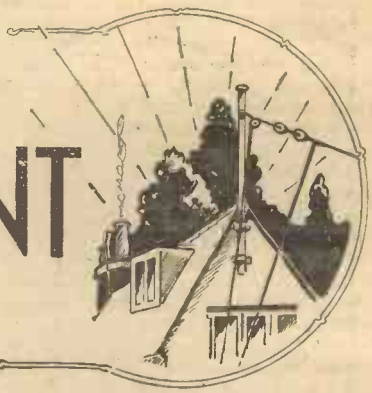
The Erie Resistors.

(Continued from page 895.)

buying separate condensers, and possess the additional advantage that they are mounted two in one case, and, therefore, take up much less room. Another advantage which the home-constructer will appreciate is that the special condensers employed are fitted with flexible leads instead of terminals. They are, therefore, more conveniently wired into the circuit.

The potentiometer for the screen grid voltage adjustment is disconnected from the H.T. circuit when the set is switched off owing to the use of the three-pole switch, hence there is no drain on the H.T. battery when not using the set, and this control may be left in its usual position—which will, of course, be found in operation. The illustrations on this and the next page show the actual components I have used. Take this list to your dealer to make absolutely certain that the goods supplied agree with the list of components given above.

BEGINNER'S SUPPLEMENT



Conducted by
F. J. CAMM

METHODS OF DETECTION.

...graphy ...have ...h-... survived the test ... valve. The former is now ... to becoming obsolete, and valve detection is the only method that need claim our attention.

... to the presence of these, ...liable to be impaired. Another ... of "leaky-grid" detection is the presence of grid current owing to the positive bias. This means a load on the tuned circuit, which is reflected as flat tuning; matters can sometimes be improved in this direction by tapping down on the coil as shown in Fig. 2.

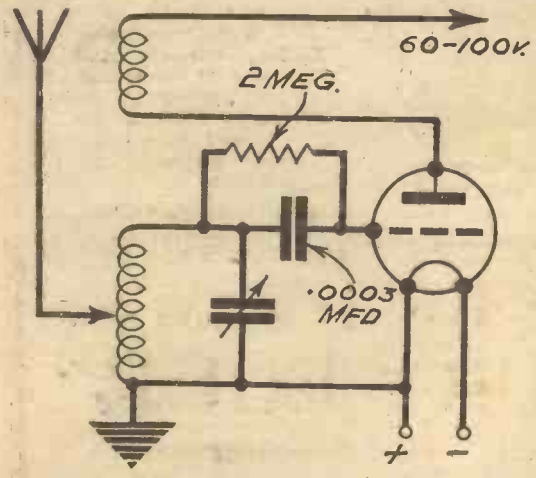


Fig. 1.—The familiar "leaky-grid" detector circuit.

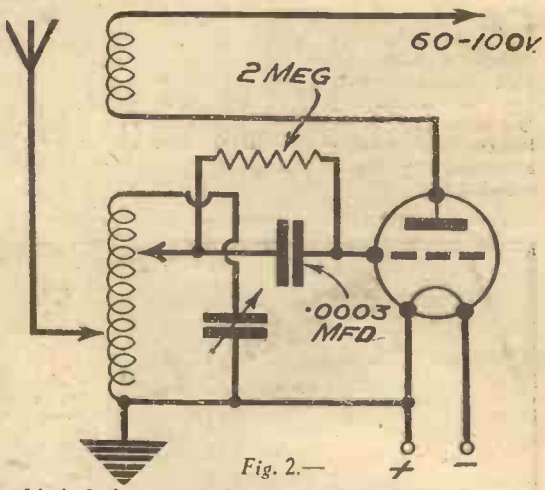


Fig. 2.— Method of removing the damping from the grid circuit.

"Leaky-grid" Detection

There are some four systems in general vogue to-day, all of which receive varying support. Each one has its merits and drawbacks, and it will repay us to examine these points in detail. Probably 75 per cent. of receiving sets used to-day embody a valve as a "leaky-grid" detector. The familiar circuit is shown in Fig. 1. This arrangement owes its popularity mainly to sensitivity, and in this direction it scores heavily over all other methods. As a rule quality is satisfactory enough for general purposes. Owing, however, to the comparatively high value of leak and condenser, the "time-constant" of the circuit is high. This means that the condenser retains its charge for a longer period, perhaps, than the interval between two successive cycles. Obviously, the shorter this interval the less chance the condenser has of returning to an uncharged condition. A short interval between cycles means a high frequency. Therefore, treble notes will suffer a certain amount of distortion, and, in fact, the higher we go the more apparent is the distortion. Harmonics will receive the worst treatment, and as a musical instrument owes its

Anode Bend Detection

Until quite recently, "anode-bend" detection was very popular; rectification depended on the bottom bend curvature of the valve characteristic and was, in fact, similar in principle to a crystal rectifier with the added advantage of amplification. In order to work on the proper part of the curve it was necessary to bias the valve negatively. One important benefit accrued from this; there was no grid current flowing and therefore no appreciable load on to the tuned circuit. Selectivity was much better than when using "leaky-grid" rectification, and providing the transmission was not modulated too deeply, quality was good. An additional advantage to battery users was the very low H.T. consumption. Nowadays, however, transmissions are modulated very deeply, and it is found that with anode bend detection reproduction is liable to be rough with large inputs as one is accustomed to receive from regional stations.

"Power-grid" Rectification

The system which seems likely to oust all others in the near future is that known as "power-grid" rectification. The circuit as shown in Fig. 3 bears a close resemblance to "leaky-grid" detection, but it will be seen that a much lower grid-leak value is used, together with a smaller grid condenser. The effect of this is to make the time-constant much shorter. Our treble, therefore, does not receive such rough treatment. Also, a much higher anode voltage is employed, 120-150 volts being quite common. Large inputs may be handled with very little distortion; as a point of fact, it is actually necessary to feed a high input in order to ensure a minimum of distortion. With this method of rectification, the loading on the tuned circuitis rather severe, and tuning is comparatively flat. Once again we may attempt to improve matters by tapping down on the grid coil. It should be noted in passing that sensitivity will thereby be reduced, but there will be an optimum point where the loss of volume is more than outweighed

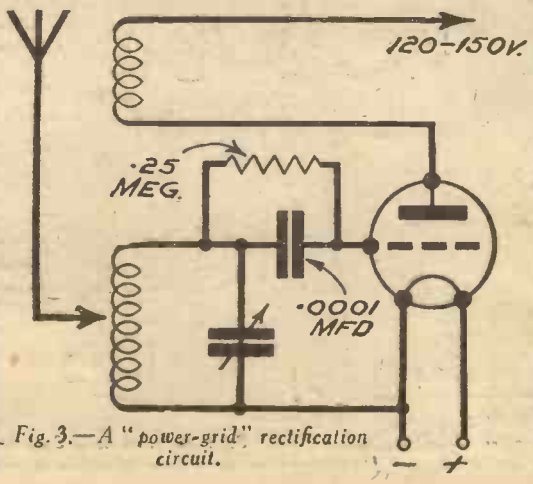


Fig. 3.—A "power-grid" rectification circuit.

The Actual Components Re

The Ready Radio Low-frequency Transformer

Telsen Tapped Pentode Output Choke.

Lissen Triple Coil

The Peto-Scott Screened Choke.

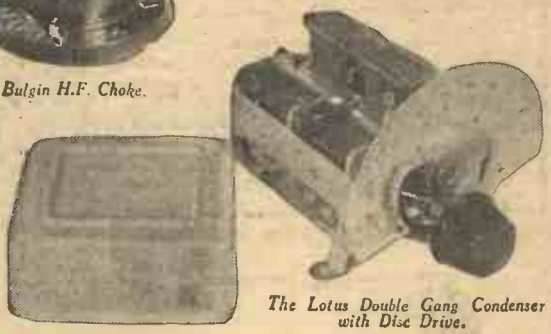
The Wearite Screened H.F. Choke.

Bulgin H.F. Choke.

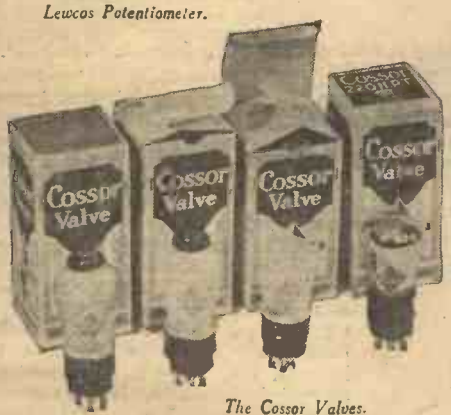
The Clix chassis mounting valve-holder you require.

Lewcos Potentiometer.

Telsen .0003 Reaction Condenser



The Lotus Double Gang Condenser with Disc Drive.



The Cossor Valves.

Wearite 3 Point On-off Switch.

Bulgin Fuse-holder.

The Ediswan Accumulator.

Ediswan Grid Bias and H.T. Batteries.

Sovereign Pre-set Aerial Condenser.

by the gain in selectivity. These remarks apply more especially to receivers which do not incorporate an H.F. stage as such sets are naturally unselective, and one cannot afford to overlook any point which may lead to an improvement in this direction. One difference between the circuits in Figs. 2 and 3 is often missed. With "leaky-grid" detection the grid return lead is connected to L.T. positive, but with the "power-grid" arrangement is returned to L.T. negative. This does not mean, of course, that the grid is biased negatively; as grid voltage is calculated with respect to the cathode (negative end of filament in battery valves), the grid potential is actually zero.

Diode Rectification

The final method of detection to receive our consideration is shown in Fig. 4. It is not a very popular one, but fully deserves to be. It is known as "diode" rectification. The reason for the name will be perfectly obvious as only two electrodes of the valve are used, the anode connection being left free. In this scheme the valve is a valve in the true sense of the word. Detection depends on the unilateral conductivity of the diode. It is absolutely distortion free and it is virtually impossible to overload it. Furthermore, there is little or no loading effect on the preceding tuned circuit, and tuning is therefore sharpened. For battery users an added attraction is the non-consumption of anode current. We now come to the one snag which has restricted its popularity. Used as a diode we obtain absolutely no amplification from the valve. It is therefore necessary to use an extra L.F. stage. It is possible to incorporate reaction, but the writer thinks that anyone who is sufficiently out for quality to use a diode, will not tolerate this. In the normal triode detector two jobs are combined, rectification and amplification. It must be perfectly obvious that the valve cannot handle both absolutely successfully. This is the great virtue of the diode; it does one job properly and we can then follow it by a well-designed L.F. stage. It is true that two valves are necessary to replace the usual one, but the results fully justify the extra complication.

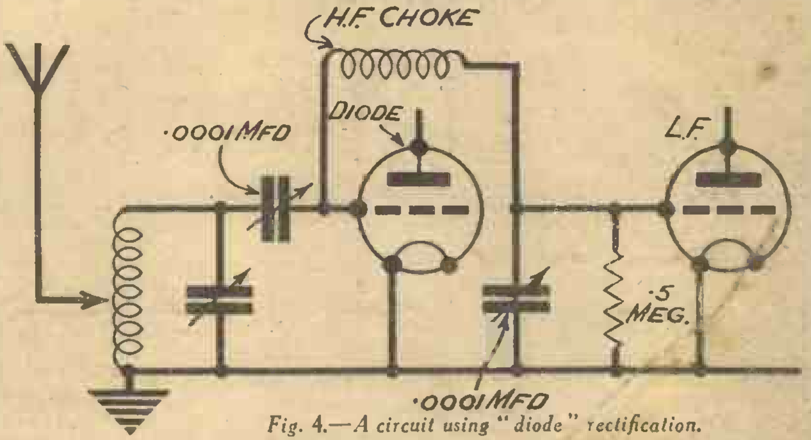


Fig. 4.—A circuit using "diode" rectification.

ROUND THE WORLD OF WIRELESS. USEFUL CALIBRATION SIGNALS.

On the 14th, 15th and 16th day of each month, except in cases where the date coincides with a Sunday or holiday, Königs Wusterhausen (Germany) transmits a series of signals according to the following schedule:—

1st Day.	2nd Day.	3rd Day.	Time. (G.M.T.)	Signal.
549.4 m., 546 kcs.	579.1 m., 518 kcs.	869.6 m., 345 kcs.	05.00–05.05	a (· —)
553.5 m., 542 kcs.	840.3 m., 357 kcs.	900.9 m., 333 kcs.	05.15–05.20	b (— · · ·)
557.6 m., 538 kcs.	849.8 m., 535 kcs.	1,096.9 m., 273.5 kcs.	05.30–05.35	c (— · — ·)
566 m., 530 kcs.	1,055.2 m., 284.3 kcs.	1,123.6 m., 267 kcs.	05.45–05.50	f (· · — ·)
570.3 m., 526 kcs.	1,069.9 m., 280.4 kcs.	1,200 m., 250 kcs.	06.00–06.05	g (— — ·)
574.7 m., 522 kcs.	1,464.8 m., 204.8 kcs.	1,339.3 m., 224 kcs.	06.15–06.20	j (· — — —)

Such signals, transmitted from this high-power station, will be found very useful for calibrating a wireless receiver by plotting a graph, showing the individual wavelengths with their respective condenser readings.

Donald P. Marcus, Managing Director of Direct Radio Ltd., recognised by "Practical Wireless" as Official Kit Distributors for the "Fury Four."
"Mr. Camm and I know you will not be disappointed with the "Fury Four"—if built with the Official Direct Radio Kit—so order with confidence.

The Editor of PRACTICAL WIRELESS

and the Managing Director of

DIRECT RADIO

PERSONALLY GUARANTEE THE

'FURY FOUR'

F. J. Camm, Editor, "Practical Wireless."
"It is with extreme confidence that I place the Direct Radio "Fury Four" before readers of "Practical Wireless." This is the first time any circuit has carried the personal guarantee of the Editor. You can build the "Fury Four" with complete confidence."

if built with a DIRECT RADIO guaranteed and tested kit . . .

HERE is the Guaranteed FURY FOUR specification.

		£	s.	d.
1	Lissen Three-gang Coil Unit type LN5162	1	6	0
1	Erie 2-megohm Grid Leak with wire ends	0	1	0
1	J.B. Unitone two-gang screened condenser .0005 mfd., with disc drive	0	18	6
1	J.B. Dual Nugang Single screened condenser with disc drive	0	9	6
1	Ready-Radio .0003-mfd. Differential Reaction Condenser	0	3	0
1	Varley Pentode Nichoke	0	12	6
1	Erie 100,000 ohms resistance	0	1	0
2	Erie 30,000 ohm resistances	0	2	0
1	Erie 5,000 ohms resistance	0	1	0
4	Erie 1,000 ohms resistance	0	4	0
1	Set of 8 Erie Resistor coupling links	0	1	0
1	pair Panel Brackets	0	0	6
1	Ready Radio fuse holder and fuse	0	1	0
1	Ready Radio Standard S.G. Choke	0	4	6
1	Ready Radio 3-pt. switch	0	1	6
1	Ready Radio S.G. H.F. Choke	0	5	6
1	Kinva standard screened H.F. Choke	0	2	9
2	Dubilier .1-mfd. C.T. Condenser type B.E.31	0	6	0
3	Dubilier 1-mfd. Condenser type B.S.	0	6	0
2	Dubilier .0003-mfd. Condensers type 665	0	1	0
1	Dubilier .0002-mfd. Condenser type 665	0	0	6
1	Lewcos 50,000 ohm Potentiometer	0	3	0
1	Sovereign .0003-mfd. Preset condenser	0	1	3
1	Ready Radio 3/1 ratio L.F. Transformer	0	8	6
2	Belling Lee Wander plugs G.B.—, G.B.+	0	0	4
3	Clix sub-baseboard valve holders 4-pin	0	2	0
1	Clix sub-baseboard valve holder, 5-pin	0	0	9
1	Belling Lee 4-way Battery Cord	0	1	9
3	Belling Lee terminal mounts	0	1	6
6	Belling Lee terminals A.E.P.U., L.S.+, L.S.—	0	1	3
1	Permcol Panel 16" x 8" drilled to specification	0	5	6
1	Drilled and foil covered baseboard 16" x 10" x ⅜", and 2 side Strips 10" x 2"	0	4	0
1	Direct Radio "159" "Fury Four" Cabinet in Walnut	1	1	0
4	Valves to specification	2	17	6
	Connecting Wire, Screws, Flex, etc.	0	0	8
		£10	17	9

So confident are we that the Direct Radio "FURY FOUR" is the ideal set for your Family's entertainment that we give this unconditional Guarantee—Build the "FURY FOUR" with a Direct Radio Kit and if you find the slightest cause for complaint, we, in conjunction with "Practical Wireless," will not consider the purchase completed until we have made your "FURY FOUR" operate to your absolute satisfaction free of charge.

DONALD P. MARCUS, Managing Director, Direct Radio Ltd.
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KIT Model 1

(less valves and cabinet) **£6:19:3**

or twelve monthly payments of **12/9.**

KIT Model 2

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(with "159" Fury Four Walnut Consolette Cabinet and Celestion PPM Soundex Permanent Magnet Moving Coil Speaker **£13:0:0**

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	£	s.	d.
Siemens 120 Volt H.T. Battery Standard Capacity	0	13	6
Siemens 120 Volt H.T. Battery Power Capacity	1	4	0
Oldham Type 0.50 L.T. Accumulators	0	9	0
Siemens 9 Volt G.B. Battery	0	1	0
Block L.T. Accumulators 80 amp/hrs.	0	11	0
Oldham 120 Volt Wet H.T. Accumulators, or 12 monthly payments of 7/6	4	1	0
Atlas A.C. 244 H.T. Eliminators	2	19	6
Atlas D.C. 15/25 H.T. Eliminators for D.C. Mains	1	19	6
Atlas A.K. 250 H.T. Eliminators with Trickle Charger, or 12 monthly payments of 8/6	4	10	0
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Epoch Twentieth Century permanent magnet moving coil speaker with Input Transformer	1	15	0
Bluespot 99PM permanent magnet moving coil speaker with Input Transformer	2	19	6
W.B. PM2 Permanent Magnet Moving Coil Speaker with Input Transformer, or 12 monthly payments of 8/-	4	5	0
R & A Victor Permanent Magnet Moving Coil Speaker with Input Transformer, or 10 monthly payments of 8/-	3	10	0
R & A Bantam Permanent Magnet Coil Speaker with Input Transformer	1	7	6
R & A Challenger Permanent Magnet Moving Coil Speaker with Input Transformer	1	15	0
Pifco Set Tester De-luxe Model	2	2	0
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New R.I Quiescent Variable Ratio Output Choke	0	12	6
Bowyer Lowe A.E.D Mark III Pickup	1	10	0
Volume Control	0	3	0
Collaro Double Spring Gramo Motor Automatic Stop	1	13	0
Collaro A.C. Induction Gramo Motor	2	10	0
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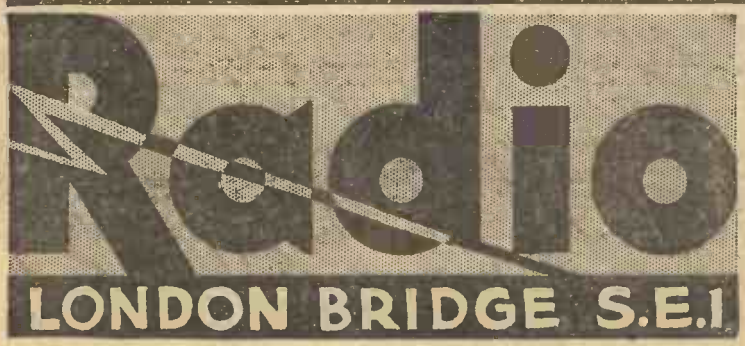

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COMMENTS ON COMPONENTS

What we Found..

"BROADCASTER" TRADE ANNUAL

THE service man, wireless set repairer, or keen experimenter will find this book a most handy reference volume to keep on the bookshelves. In addition to a complete Directory divided into classes of components and sets, there is a list of Trade Names, list of products, supplies, and a list of wholesalers. The technical section contains a list of the supply voltages for the majority of the towns in England, and complete formula for all wireless purposes. Radio servicing receives over a dozen pages, explaining methods of fault finding and testing. At 5s., this is a valuable volume which should and undoubtedly will find a ready market.

LEWCOS CONDENSERS

WE are advised that the well-known Lewcondensers, Type O and W, have been reduced in price from 2s. to 1s. 6d.

IGRANIC TRANSFORMER

WHERE space is a consideration, a small transformer becomes an essential item in the receiver. There are several difficulties, however, in the design of an efficient transformer of small dimensions, but the Igranic is certainly a miniature masterpiece. The dimensions are 2⅞in. by 1¾in. by 1⅝in., and the weight only 6½oz. In spite of this, however, the primary inductance is over 60 henries. It is stated that the core is of a new material, and that the iron circuit is so small that the stray field round the transformer is almost negligible. The result of this is that two of these transformers may be mounted close together without interaction. It is also stated that no earthing of the core is necessary. Fitted with a brown moulded bakelite case, this transformer is obtainable in two ratios, 3 to 1 or 5 to 1, and the price is in each case the same, namely, 10s. 6d. A really excellent product.

WATES DISTANCE SWITCH

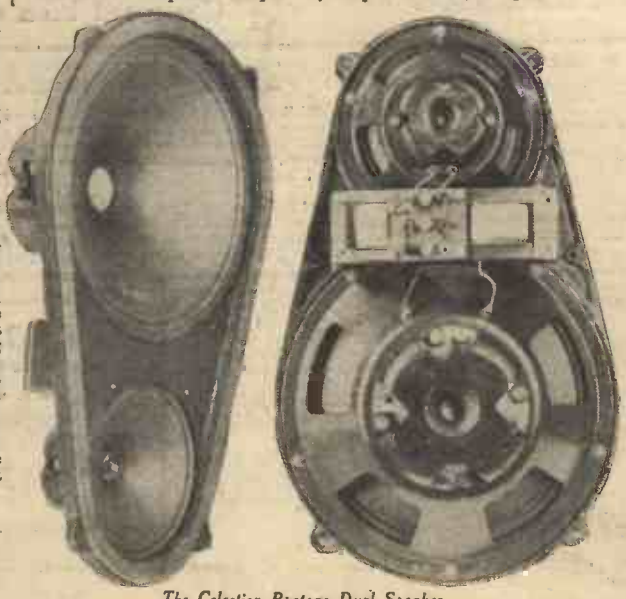
AN article has already been written in these pages explaining the advantages of remote control, and the Wates switch was illustrated therein. This works by means of a solenoid and a toothed wheel. An armature is disposed inside the solenoid, and a small finger is held by a weak spring against the toothed wheel. This is provided with a small commutator having four brass segments and four ebonite segments. Two spring contacts bear against this commutator, and when a current is passed through the solenoid the armature is drawn up and thereby causes the finger to engage behind one tooth of the toothed wheel. This rotates the commutator a quarter of a revolution and alternately brings the brass segment or the ebonite segment against the spring contacts. The contacts are provided with two terminals, and two additional terminals are provided for the battery to operate the solenoid. By employing an extended lead from these latter terminals, and connecting push switches in these leads, the solenoid may be operated from a distance. The current taken was found to be about .8 of an amp, but as it is only necessary to press the button for an instant to make the commutator make the necessary connection, a dry battery may be used for the purpose, and will last quite a long time. This point must be borne in mind when using the switch, and the button must only be pushed for an instant, just sufficient to bring the relay into operation. The switch is inserted in either the low-tension lead or one of the mains leads, and the two terminals are completely isolated from the terminals used for the distant switches, so that the apparatus may be employed with a mains set in perfect safety. The price of the switch is 9s. 6d., and it will be found a very useful device for remote control, an article on which appeared in a recent issue of PRACTICAL WIRELESS.

S.G. ANODE CONNECTOR

WHEN a metallized S.G. valve is employed, the metal coating is joined to H.T. negative (earth). The flexible lead which is joined to the terminal on the valve is joined to H.T. positive, and therefore, if this lead comes into contact with the metal coating, the H.T. supply is short-circuited. The usual method of employing a metal spade at the end of the flexible lead for connection often leads to this trouble, but the Belling-Lee special connector avoids the difficulty, and also enables the connection to be made very easily. It consists of two parts, a socket and a plug, all ebonite coated. The socket portion is attached to the screw of the S.G. anode terminal, and the socket is attached to the flex. All that is necessary to make connection is to fit the socket over the plug. This ingenious and useful accessory only costs 4d., and for those who object to even this expense, a cheaper model is made at 2d. This has the socket part screwed under the S.G. terminal and plugs in sideways. The ingenious experimenter will find many other uses for this little component.

CELESTION REETONE SPEAKERS

WHEN it is desired to get a really ideal output, with correctly balanced reproduction of the highest and the lowest note, the new type of dual speakers will be found invaluable. It is asking rather a lot of one diaphragm to respond to, say, a 30 cycle organ note with the same accuracy as a 4,000 cycle note. The dual-matched speaker has, therefore, been introduced, and consists of a large metal chassis carrying two loud-speakers of different sizes. The illustration below shows the Celestion assembly, with the small speaker at one end and the large one occupying the remainder of the chassis. Each speaker is of the permanent magnet type, and has its own input transformer. In addition, a set of sockets and plugs enables varying degrees of tone to be obtained. The small speaker deals with the higher notes in the musical scale, and the large speaker handles the bass notes, and with the addition of the plug and socket arrangement it is possible to get a wonderfully realistic tone. Of course, a baffle is essential with the assembly, and this should be cut to take the complete assembly, and a larger fretted front may then be attached over the baffle to hide the rather odd-shaped cut-out. On test, it was found that the speaker would handle a really heavy signal (of the order of 3 to 4 watts) and was just as satisfactory on a small input of 800 milli-watts. The complete absence of boom was one of the principal features which was noticed, and the brilliance on violins, speech, and such items as cymbals and similar noises was very pleasing. Although there are two complete loud-speakers, the price of the complete assembly is only £4 5s., and there are three distinct models available. One employs two permanent magnets, one consists of two energized field windings, and the remaining model utilizes one of each type. The price is the same in each case. The makers are Celestion, Ltd.



The Celestion Reetone Dual Speaker

MELBOURNE SWITCHES

THE switch illustrated is one of the novel components manufactured by the Melbourne Radio Supply Company. The illustration shows the internal construction of this rotary switch, from which the mechanism is clearly seen. The outer casing of the switch consists of an ebonite box with terminals attached to the sides. The end of the terminal inside the box is recessed with a small hollow, and the operating knob of the switch is attached to a solid piece of ebonite, which just makes a nice fit inside the box. A hole is drilled through this solid piece, and through this is fitted a spring with a solid brass pin at each end of the spring. When the assembly is put together, the small brass pins are forced against the inner wall of the switch by the spring and engage in the recessed base of the terminals. There is thus a definite position for the switch in each position, and this may be felt when rotating the switch knob and a definite click may also be heard. A fan-shaped indicating plate is provided, and the switch is obtainable in either "On-Off," or "Radio-Gram" lettering.

The Melbourne Rotary on-off switch.

The On-Off switch costs 1s. 6d., and the Radio-Gram switch costs 1s. 9d., in either black or brown.

SOVEREIGN SKYHAWK S.G.3.

IN a leaflet just to hand from Sovereign Products, Ltd., a blueprint is given of the Sovereign Skyhawk S.G.3, an efficient and economical three-valver (S.G., Detector, and Power valve). The cost of building this useful set, chiefly using Sovereign Components is a little over £2, exclusive of valves and batteries. Hints on building the set are given in the leaflet, a copy of which can be had free on application to Sovereign Products, Ltd., Sovereign House, Rosebery Avenue, London, E.C.1.

TWO SPLENDID SIXPENNY HANDBOOKS

READERS who wish to obtain a reliable source of information regarding the construction of all types of wireless receivers, from a crystal set upwards, should obtain "Make Your Own Wireless Set" and "Modern Wireless Sets and How to Make Them," each costing 6d. and containing 80 pages of wiring diagrams and lucid text relating to the construction of the very latest receivers. Full lists of components are given in every case. Both volumes are by F. J. Camm, and are obtainable for 7½d. each post free from Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2.

TESTING LOUD-SPEAKERS

THE majority of beginners usually have a loud-speaker of the moving-iron variety, and there are several quite simple tests which may be carried out to test the frequency response, sensitivity and other features of this type of speaker. The most important feature of any speaker is its frequency response curve, and this can really only be satisfactorily tested by connecting the speaker to a first-class amplifier which is joined to a gramophone pick-up, the whole used in conjunction with constant frequency records. Of course, it is of no use testing the really low notes on this type of speaker, as the radiation falls off appreciably when below 80 cycles.

Faults

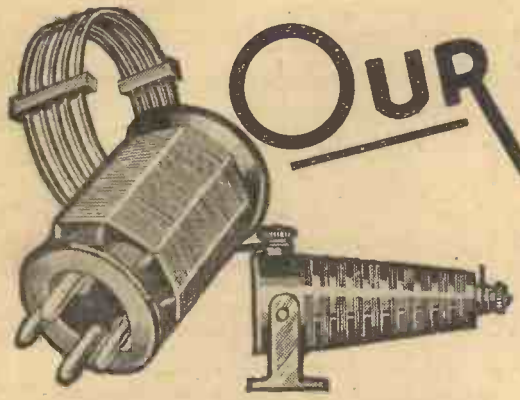
There are two principal faults which can arise in the moving-iron type of speaker, and these are electrical or mechanical. As the operating mechanism of this type of speaker is a magnet and armature, the obvious faults are short-circuits due to the insulation becoming worn away from the connecting leads, or metal filings, or similar material across the input terminals. This will result in complete cessation of signals. Leakage from the coil windings to the frame will result in a greatly decreased output, the strength depending upon the actual leakage. If the windings are only partially shorting, due to faulty insulation, scraping and scratching noises will be caused when the speaker is in operation, and by gripping the unit tightly in the hand this will be decreased. The impedance of the loud-speaker (as distinct from the D.C. resistance) will also vary the strength of the reproduced signals, and this factor should be borne in mind when a speaker is first connected up and fails to give complete satisfaction. Especially is this the case when a pentode is employed in the last stage of the receiver, with no compensating output circuit.

Mechanical Faults

Under this heading there are quite a number of troubles which can mar the reproduction. First and foremost is the rattle caused by loose nuts. The cone attachment in the apex of the cone may work loose after constant use, and this results in a peculiar form of "dither" which stops if the cone is lightly pressed with the finger tips just round the cone attachment. Looseness of the clamping nuts of the speaker casing results in a metallic rattle which is most noticeable when loud signals are being handled, or very low notes are being reproduced. Sometimes the material which surrounds the periphery of the cone becomes distorted, due to atmospheric conditions, and this results in the cone twisting as it is driven backwards and forwards by the armature. The only cure for trouble of this sort is, of course, a new diaphragm surround, and this should preferably be of leather and not rubber. Special thin leather is obtainable for the purpose and this lasts much longer than rubber, and is not so susceptible to rotting.

Cabinet and Baffle Troubles

Very often rattling and other noises may be caused by sources outside the actual speaker. These are due principally to insecure mounting to baffle boards, or loose joints or screws in the speaker cabinet.



OUR SHORT-WAVE SECTION

CONSEQUENT upon the opening of the new Empire Transmitter at Daventry, short-wave reception is becoming increasingly popular. Many amateurs are building short-wave sets, and it is not unlikely that in the near future even domestic receivers will be designed to work on wavelengths down to 15 metres or so. In the past a short-wave set has been looked upon as rather a special instrument intended only for the more advanced experimenter. As a result, sets of this type were made in somewhat "rakish" form and were fitted with numerous "gadgets" and controls which, in themselves, were sufficient to scare the average listener away from short waves. But these things are rapidly changing, and a short-wave receiver is beginning to look more and more like the broadcast set. Partly as a result of this, and partly because the number of S.W. stations giving out interesting programmes is quickly growing, the ordinary constructor is giving more attention to short-wave work. This is all to the good and the change will lead to greater simplicity of design and operation. Already the use of plug-in coils is becoming a thing of the past just as it did in respect to broadcast receivers a few years ago. Thus two or three manufacturers have put on the market dual—and triple—range S.W. tuners which are very efficient and help to simplify construction very considerably. But up to now (so far as I am aware) no constructional details have been given in the Press regarding tuners of the latter type and it is for this reason that I am writing the present article.

12—70 Metres

The three-range tuner of which particulars are given in Fig. 1 will cover the wavelengths of from approximately 12 to 70 metres when tuned by a .0002 mfd. condenser. This range is a very wide one, of course, representing a frequency range of from 25,000 kilocycles to 4,250 kilocycles, and so it is divided into three portions, which give approximately 12 to 20, 18 to 38 and 35 to 70 metres respectively. It will be seen that the bands overlap slightly and thus permit of an unbroken tuning range from the lowest to the highest wavelength.

The change-over from one wavelength to another is effected by means of two ordinary push-pull switches which each short-circuit a portion of the tuned winding. Reaction is provided, and by dividing the reaction winding into two parts, situated one at each end of the tuned winding, a more or less uniform degree of reaction coupling is obtained over the full tuning range.

Making a Triple-range Short-wave Tuner

Parts Required

The few materials required to make the tuner are:—

One, 3½ inch length of six-ribbed ebonite coil former, 1½ins. diameter. (The diameter is measured *outside* the ribs.)
Six, 6 B.A. terminals.
Six feet, 18 gauge enamelled wire.
Six feet, 26 gauge enamelled wire.

Construction

First of all drill six ⅛in. holes around one end of the ebonite former and securely fix the terminals into them. Next make a pair of 1/16in. holes about ⅛in. away from the "terminal" end of the former, and anchor one end of the thinner wire in these, leaving a couple of inches of wire projecting inside the tube for later connection. The method of anchoring the wire is to pass the end through one hole, back through the other and back to the inside again through the first. Now wind on four turns, cut off the wire and secure the end by passing it through another pair of holes made in a suitable position.

Leave a space of about 3/16in., and then make another pair of holes (about ⅛in. this time) for securing the end of the thicker wire. Fix the end of the 18 gauge wire in these and wind on two turns before making a looped tapping as shown in a detail on Fig. 1. Pass the loop through a ⅛in. hole in the former and continue to wind on another three turns; make another loop and then put on the remaining seven turns. Terminate the winding by passing the wire through another pair of holes as at the beginning. It will be seen from Fig. 1 that all the turns of thicker wire are spaced by about the thickness of the wire; the spacing increases the tuner's

(Continued on page 908.)

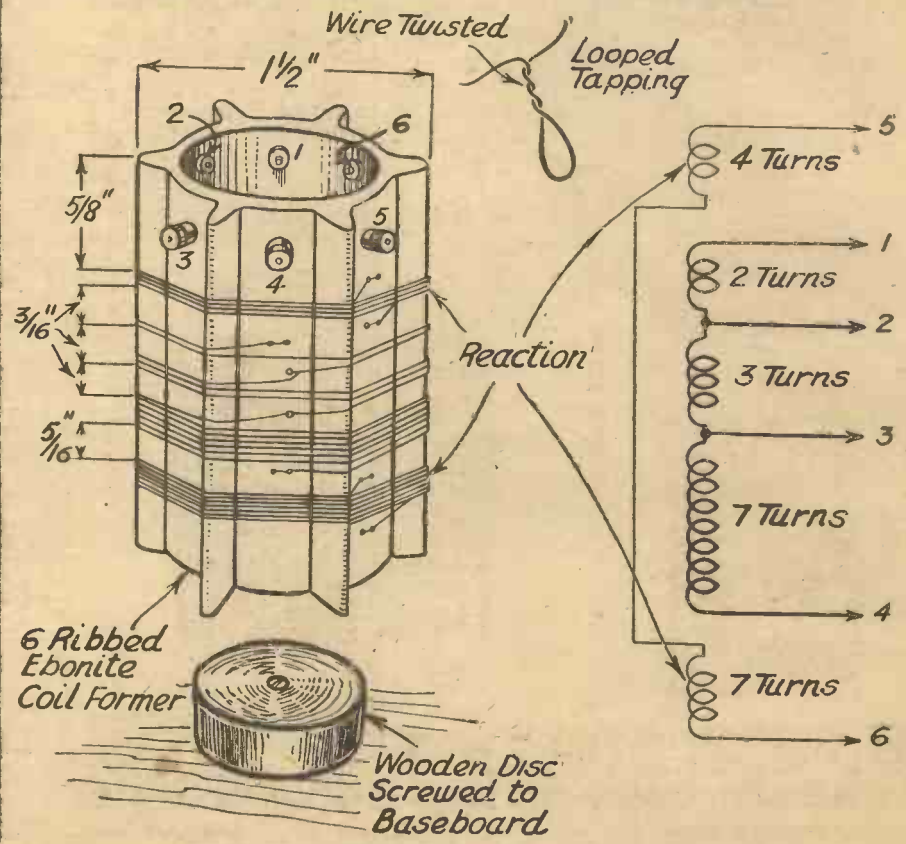


Fig. 1.—Constructional details of the short-wave tuner

OTHER LOTUS COMPONENTS

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Output Choke 20 Henri type D.C.1. Price 5/6.

Universal Switch U.S.3. Price 1/6.

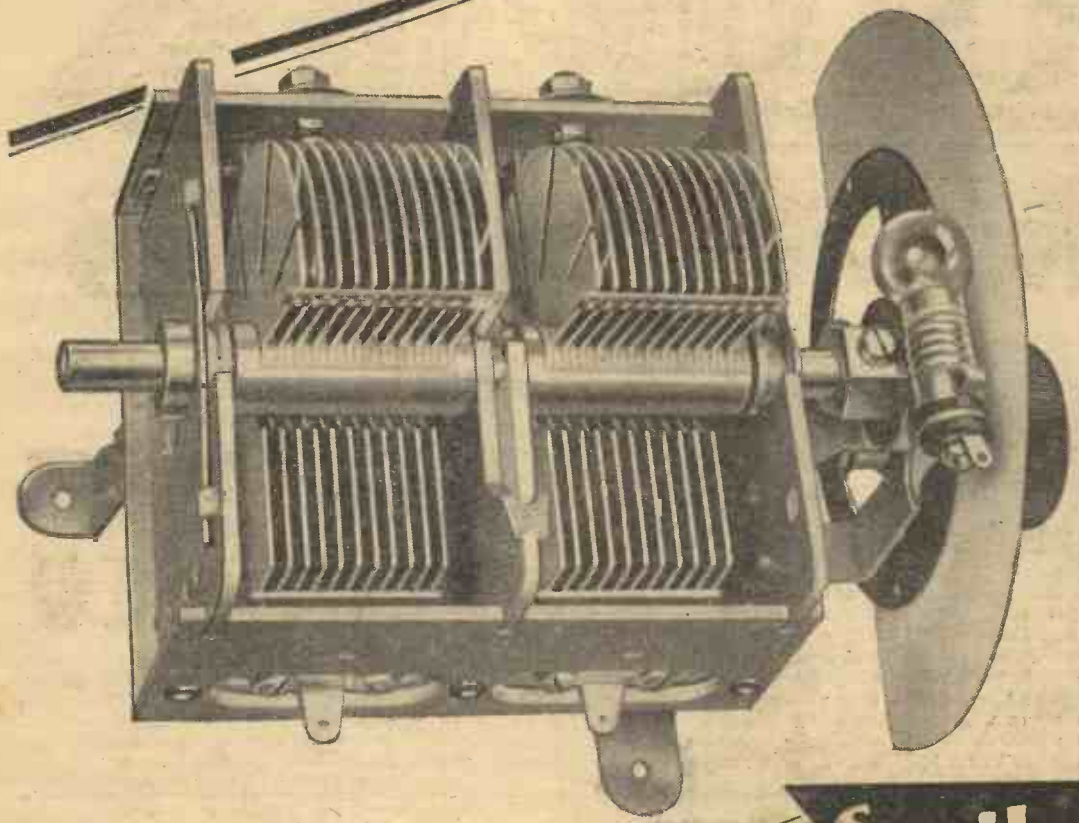
R.F. Choke designed to work on 1500/2000 metre wave band type R.F.C.1. Price 2/6.

L.F. Transformer No. 1. A.T. 13, ratio 3-1. Price 5/6.

2 GANG CONDENSER

with similar specification to the Single Unit Condenser.

WITH DISC DRIVE TYPE P.C.2



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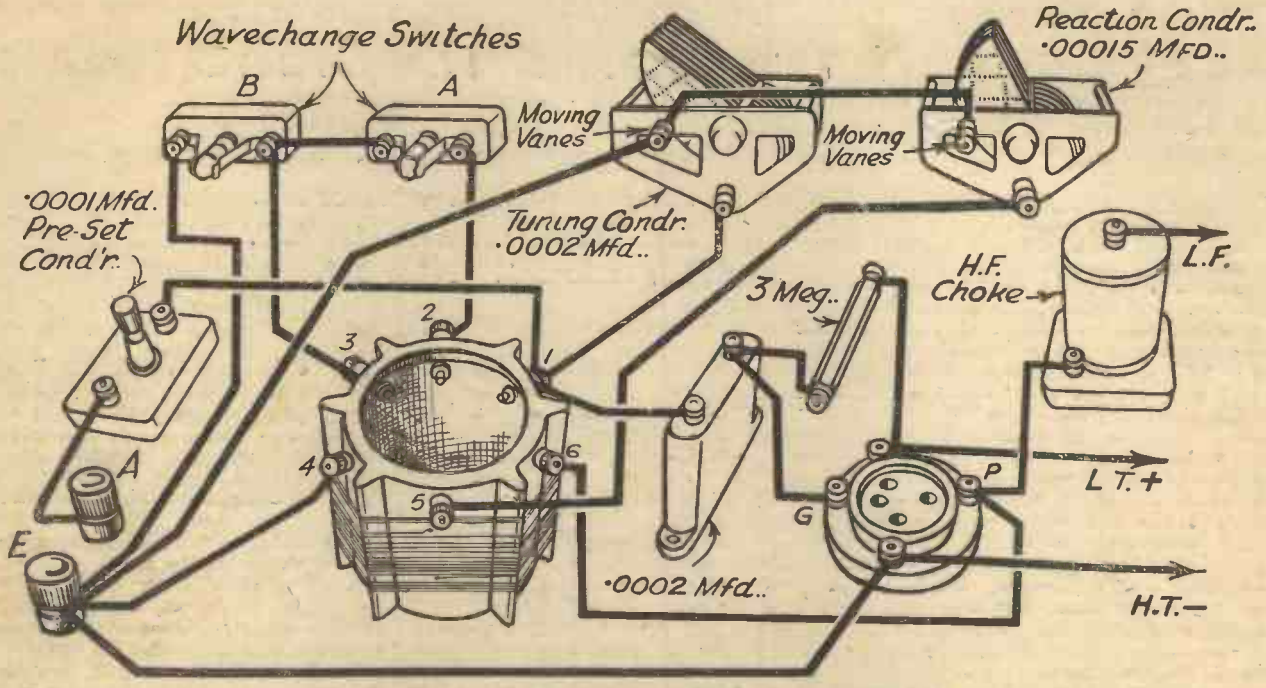


Fig. 2.—Diagram showing how the tuner should be connected up.

(Continued from page 905.)

efficiency by lowering its self capacity. To prevent the turns from slipping, a good tension should be kept on the wire whilst winding. Lastly put on the other portion (seven turns) of the reaction winding, leaving a space of 5/16in. between it and the lower end of the tuned winding. To fix the turns more securely in position they should be given a coat of shellac varnish.

And now all the tappings must be soldered to their proper terminals. Before doing this cut them to such lengths that they will just reach the terminals, and scrape the ends bare. If it is necessary to cut any wire off the loops make sure that both sides are soldered to the terminal, because if this is not done the continuity of the winding will be broken. The proper terminal connections are shown diagrammatically in Fig. 1 and the relative positions of the terminals are clearly shown in Fig. 2. Notice that the two halves of the reaction winding are joined in series by soldering the end of the upper winding to the beginning of the lower one.

The simplest way to attach the tuner to the baseboard of the set is shown in Fig. 1; a wooden disc is made to fit tightly into the ebonite former and is secured to the baseboard by means of a screw.

Using the Tuner

The tuner is very suitable for use in the aerial circuit of any short-wave set, adaptor or converter, and in each case the connections will be as shown in Fig. 2. Suitable values for the more important components are also shown in the latter figure, and these should be adhered to with fair accuracy. The .0001 mfd. pre-set series aerial condenser is a necessity and prevents damping of the tuned circuit by the aerial load. If it were omitted it would in most cases be impossible to obtain oscillation. Its optimum setting will depend to some extent upon the length and capacity of the aerial employed as well as the wavelength range in use. I do not say that it will have to be adjusted each time a change is made from one wavelength range to another, but very often it will be found that improved reception of certain stations will result from a slight and careful adjustment.

Both wavechange switches are of the normal two-spring push-pull type, but it is important that good ones should be used because if the contacts are not perfect they will give rise to crackling sounds.

When both switch knobs are pushed in the highest wavelength range (35 to 70 metres) is obtained; by pulling out switch "B" the range is from 18 to 38 metres, and when both switches are pulled out the tuner works on the very lowest range. The capacities of tuning and reaction condensers are shown to be .0002 mfd. and .00015 mfd. respectively. These values are most suitable, but they might be increased to .0003 mfd. and .0002 mfd., or reduced to .00015 mfd. and .0001 mfd. without affecting efficiency to any marked extent. Both condensers should be good ones designed especially for short-wave work, and it is desirable (from the point of view of easy tuning) that the tuning condenser at least should be provided with a vernier control. The H.F. Choke should, of course, be a special short-wave one and not of the ordinary type intended for a broadcast receiver.

THE NEED FOR DE-COUPLING.

AN enthusiastic listener who lives near me complained recently of the high cost of running his set, a statement I could not understand, as it was an ordinary three valver, S.G., det. L.F., battery operated, and commercially built. The trouble appeared to be in the high tension supply. My friend hadn't the mains in his house, and it seems he found it necessary to buy a new high tension battery every month or so. Granted he used the set considerably, say, four or more hours every night, he still felt his high tension was costing him too much, and when I went round one evening he happened to be in the act of fitting a new battery. It is true his grid bias battery was not above reproach, and he had no idea that the plug had to be changed to different value according to the state of the H.T., but the real trouble was in the set itself. It was one of those cheap sets sold at barely the price of the parts, and I found that when the old H.T. battery was connected to the set low-frequency instability was taking place and setting up the usual howls due to the back-coupling of the battery which obviously had developed a high internal resistance. On testing with the voltmeter, however, I found that the voltage drop was at the very outside not more than 20 per cent., so that my friend had been throwing away more or less good batteries on account of these howls. To cut a long story short I took around a 2 mfd. fixed condenser, and placed this across the H.T. terminals, when the set worked perfectly.

This brings me to what I set out to say, that certain manufacturers who think in terms of price only—and perhaps the customer is partly to blame also—too frequently omit any de-coupling arrangements on battery sets on a price basis. It is as penny-wise-and-pound-foolish as buying H.T. batteries of too small a capacity, and does radio harm through making it a more expensive pursuit than it actually is. A few shillings spent on a fixed condenser or two will often save the set-owner much more than this in battery replacements, and if you know of any non-technical listeners who are in similar difficulties, or at all likely to be on account of the design of their set, I should like you to feel it your duty to help them all you can. Only by people getting the very best results will radio become even more popular, and it is the duty of all of us who have the technical knowledge to help the novices understand the working of their sets.—DETECTOR.

IDENTIFYING THE FOREIGNERS

WAS IT A DUTCHMAN, CZECH, FRENCHMAN OR SWEDE?

By J. GODCHAUX ABRAHAMS

IN Europe alone to-day there are roughly 230 broadcasting transmitters operating in twenty-eight different countries. You may take it that the average listener, sitting at his receiver, even only a modest three-valver of modern construction—may easily tune in from *forty* to *fifty* transmissions in the course of an evening's tour of the ether, and during this period he may hear a dozen different languages—if not more. In the course of a week, I receive a number of inquiries in which correspondents anxious to identify a transmission state very vaguely that "*the announcer spoke in French or Spanish; possibly German or Czech.*" To the British listener who only knows his Mother tongue, all other languages are classed under one heading, namely, *foreign*—a delightfully vague term. Admittedly, it is not easy to identify your captures unless you have some idea of French, German, Spanish, Danish, Czech, and so on, but the problem is not so difficult to solve as might appear at the outset. It is to assist listeners so puzzled that this article has been written. The first step to take if, when twirling the condenser dial, you happen to pick up one of these mystery broadcasts is to ascertain roughly—or better still, accurately, if you can do so—the wavelength on which the transmission is made. Little experience will be required to know in which waveband the broadcast falls, namely, whether between 200 and 550 metres, or whether above 1,000 metres. As there is a much greater number of transmitters in the medium waveband, a more precise estimate of wavelength will be required. It is to be presumed that you have already logged some stations—perhaps B.B.C. broadcasters—with their respective condenser readings; if so they will supply the necessary landmarks to establish this valuation.

Establishing the Wavelength

Is the mystery station tuned in at a point somewhere between two such known transmitters as, say, above London National and below London Regional, or roughly midway between Midland Regional and Brussels? The reply to such a question will give you to some extent the data required, it will tell you that the station you are trying to identify is operating between so-and-so and so-and-so metres. By this method you have narrowed down your search to a definite portion of the waveband. Another and more accurate way of establishing the wavelength is by plotting a graph; it is quite an easy matter, but space will not permit me to describe the method in this article. Now, for the question of language, interval signal or other peculiarity by which the broadcast may be definitely recognized. You must, however, bear in mind one important point; it is that, as in Great Britain, most of the main continental stations relay their programmes to smaller transmitters for local re-broadcast and, consequently, when such an interchange is taking place you may not receive the actual call of the station heard, but that of the *main* studio which is feeding it. As an example, take Nurnberg (239 m.) from which, at most hours of the day, you will pick up the call of Munich (532 metres). You could not mistake the former for the latter in view of their difference in wavelength. In the same way, on international nights, a concert emanating from, say, Vienna or Berlin, might be received through Warsaw, Prague, Beromunster, Brussels, and a number of other cities taking the relay. Switzerland, for instance, frequently links up with Vienna or Munich, Oslo with Copenhagen, and so on, but this will not mislead you if you narrow down your search, as already explained, to a relatively small portion of the waveband. Moreover, the published programmes in such a paper as *World-Radio* will give you the information as to the

(*Continued on page 910.*)

Was it a Dutchman?

(Continued from page 909.)

class of entertainment heard and its actual origin.

Identifying the Station Calls

It is essential that you should know how the stations work in groups, that, say, Milan, Turin, Trieste, Genoa, and Florence frequently radiate the same programme, that *Ecole Supérieure*, Paris, feeds a number of provincial stations, that Frankfurt-am-Main and Stuttgart (*via* Muhlacker) exchange broadcasts throughout the day, and other information of this tenor. In most instances, the actual call will tell you from which studio the transmission emanates, as most of the relays remain connected to the mother station for a long period, and thus between items the original call will be heard. The question of language is a more difficult one to tackle, but here are a few pointers. Without exception all German stations precede the name of the city in the call by the word *Achtung!* (pronounced: *ach-toong*). The French and Belgians (with the exception of Brussels No. 2, which announces in Flemish only) by a double-barrelled *Allo!* The Italians have coined a word sounding like *Eh-yah*, which represents the initial letters of the Broadcasting Corporation, E.I.A.R. Vienna, although speaking the German language, does not use the word *Achtung;* you will hear *Hallo Radio Veen*, the native name of the Austrian capital being *Wien*. Beromunster, relaying Berne, Zurich, and Basle, all cities of the German-speaking districts of Switzerland, uses both *Achtung* and *Hallo*. Here, however, it is necessary to explain in conjunction with the calls that the native names of foreign cities unfortunately do not necessarily correspond with those we have given them in English. It is not always merely a question of pronunciation such as *Paree* for Paris, but in many instances the difference is much greater. Munich will not advertise itself as Munich, but as *Muenchen;* from one of the Italian transmitters you may pick up a call which includes *Milano, Torino, Genova, Trieste* (pronounced: *Tree-ess-tay*) and *Firenze*. From it you must understand that you are listening to a programme common to Milan, Turin, Genoa, Trieste, and Florence. *Napoli* is the true appellation of Naples; *Roma* needs no translation. When it comes to the Polish studios the differences are still more marked, as Warsaw will be heard as *Warszawa* (*Varschavva*), Lwow as *Lvoof*, Lodz as *Woodsh*, and Katowice as *Katow-vee-tzee* or Posen as *Poz-narn*. Prague reveals its identity as *Praha*, Kovno as *Kow-nass*, Belgrade becomes *Bay-o-grad*, Berne (*Bairn*), Copenhagen (*Key-ob-en-harvn*), Algiers (*Al-jay*), and others too numerous to mention. But you will be surprised how soon you will recognize and mentally translate these sounds into more familiar names after you have heard them from time to time. Most stations have realized that their broadcasts are heard, not only by their local subscribers, but by listeners in foreign lands, and also that the recognition of a transmission with the consequent knowledge of its origin greatly adds to the interest of the broadcast. In consequence, to facilitate this identification they have devised various mechanical means by which distinctive signals can be trans-

(Continued on page 911.

Was it a Dutchman?

(*Continued from page 910.*)

mitted during intervals in the programme. In some cases they are self-explanatory, in others they require memorizing for a future occasion. As examples of the former, take Hamburg, with its morse signal HA, or Kiel (KL), Hanover (HR), Flensburg (FL). Vienna when opening up usually puts out a series of morse v's, and Graz, as an alternative to the monotonous metronome *tick-tock*, sometimes uses the letter K (—.—).

Metronome Interval Signals

It is a pity that the metronome, as an interval signal, should still be so widely adopted, as obviously nothing is so much like a metronome as another metronome! Some stations have had the happy thought, when they could not think of a better method, of taking a different number of beats from others. You might make a note of the following which may assist you in logging the actual transmitter:—

Belgrade (60 beats per minute), Berlin and Königswusterhausen (210 beats), Breslau (240 beats), Bucarest (160 beats), Frankfurt-am-Main (190 beats), Kosice and Riga (80 beats), Radio Maroc (Rabat) (60 beats), Vienna (270 beats), Zagreb (106).

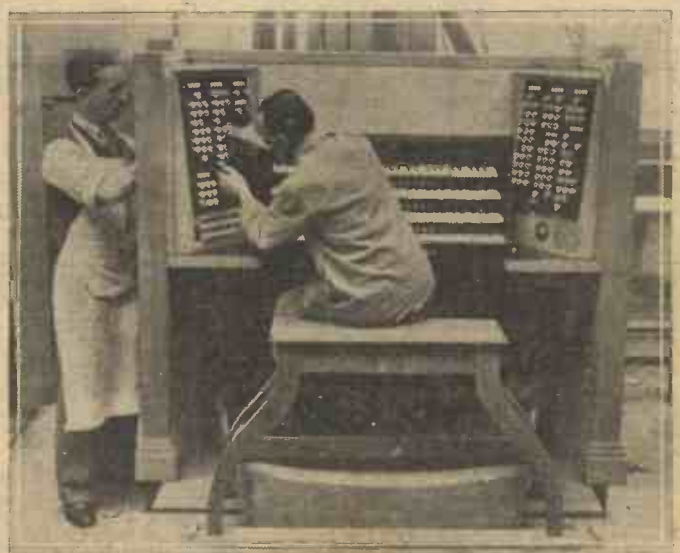
Apart from the frequency of the ticking, it is possible to note differences in tone or pitch, and you will soon differentiate between the metallic *ping* of Radio Maroc and the dual *Tock-tock* of, say, Vienna. Stations such as Strasbourg and Radio Toulouse are already known to most listeners in the British Isles, the former with its incessant bell, and the latter with its series of deep booming notes. But bells in some form or other have been adopted by many studios, either singly or in combinations of two, three or more notes, and also in short musical phrases of which the melodies are associated with the individual country or city.

Of single bells the following should be noted: Istanbul and Tallinn (60 per minute), Stockholm (about 80), Radio Strasbourg (about 16); at the following studios bell-like notes produced by oscillating valves are used: Heilsberg (Konigsberg and Danzig), just two notes (D flat, A flat), Leipzig, four notes (B A C B), Stuttgart (heard through Muhlacker and Frankfurt), 3 notes, (C D G). From Langenberg you will hear chimes (5 notes). In the matter of short musical-box melodies, there is a wide selection, as this permits a highly distinctive signal. You will pick up different tunes from Copenhagen, Oslo, Munich, Budapest, Warsaw, Beromunster (with a distinctive phrase allotted to Berne, Basle or Zurich, according to whichever city is relayed), Madrid, Naples, etc. Again, breaking away from the conventional, some stations have adopted such signals as a trumpet call. Algiers opens its broadcasts in this way, as does Wilno, or the song of a bird, such as the nightingale, imitated by Turin, Milan and the other North Italian studios. A cuckoo call may be picked up from Llubljana, Wilno, and Radio Beziers, but their wavelengths will prevent confusion. Radio Vitus (Paris) gives you the crowing of a cockerel; Prague also opens its early morning transmission in this manner.

Women Announcers

For some time it was possible to state definitely that announcements heard in a feminine voice stamped the broadcast as of Italian origin; to-day you cannot rely on this fact, for many studios in other countries have entrusted these duties to women. Strasbourg, however, possesses the peculiarity of giving out its announcements in two languages, in French by a woman and in German by a man. Female announcers also officiate during certain periods of the day at Copenhagen, Stockholm, Algiers, Sottens, Katowice, Warsaw, Fécamp and at a number of German studios. In the space at my disposal it is obviously impossible to give you any idea as to the different languages spoken in Europe; they are too numerous. You must, however, bear in mind that most of them belong to one of three groups, namely, Teutonic, Latin or Slav. In the first we class German, Dutch, Danish, Swedish, Norwegian, and Flemish; in the second, French, Italian, Spanish, Portuguese; and in the third Russian, Polish, and, to facilitate matters, we associate with them Czech, Finnish, and Magyar. There are, of course, strong differences in languages of the same group, but it requires little experience when listening to differentiate between, say, a Teutonic and a Slav. tongue. In the same way, you will find that you will soon detect whether you are listening to a German or a Dutch broadcast, or whether an announcement was made in Polish, Czech or Magyar (Hungarian).

THE NEW B.B.C. ORGAN.



The new £10,000 organ which is being built for the British Broadcasting Corporation will be ready for use early in February. It has 150 electrical stops and 2,326 pipes divided into 31 tones. It has been built by the John Compton Organ Co., Harlesden, London, N.W. The photo shows an expert adjusting the draw stop action on the new organ.

RADIO RAMBLINGS

Metal versus Wood Panels

IN radio, as in most other things, fashion changes rapidly and there is a tendency for the order of things to repeat itself occasionally. That this is so struck me the other day when handling a set with a wooden panel and wooden knobs. Was not our very first ventures in the world of wireless carried out by means of a wooden panel which we sometimes shellaced and sometimes didn't? Then we tried ebonite, rough, dirty stuff that had to be sand-papered before use to remove the particles of tin-foil which adhered to the surface as a residue from a manufacturing process. Do you remember doing this?—and do you remember the result after some 30 minutes hard scrubbing with sand-paper and the subsequent light coating of oil that we were instructed to rub in? Well, I do, and I also remember parting with a small fortune in the purchase of a piece of the first highly-polished ebonite that appeared on the market, guaranteed free from surface leakage and complete with a test certificate as to the voltage it would stand. Ebonite then took great strides and we were soon able to obtain it in many varied and beautiful colours. Mahogany-coloured ebonite found favour for a while and some really beautiful panels resulted, but quite a simple thing caused this material to fall from favour. This was the real difficulty in getting knobs to match the panel. Knobs and dials could be obtained for some components but not for all, as lack of standardisation of threads and diameters of spindles of condensers, rheostats, reaction condensers, volume controls and other variable resistances then the order of the day sounded the death-knell of the amateur's use of figured ebonite. These panels therefore soon became the prerogative of the commercial set builder who was able to design his knobs to suit his panel. Soon after this came a rage for aluminium panels with their peculiar mottled surfaces. They tarnished quickly, however, despite generous coats of lacquer that were applied, and many a valve met an untimely end through the shorting of the H.T. across the filament *via* the metal panel due to a large extent through further lack of uniformity in components. You see, some of them required insulating bushes when used with metal panels, and some did not, and it is easy to see that confusion too often arose with most disastrous results to our long-suffering valves. In any case the metal screen and base board possessed many advantages both in practice and in theory that far outweighed those of the metal panel. Now we come back to the beginning, and wood is once more coming into its own as panel material. Of course, the loss due to really dry wood is not very high, but when it becomes moist quite an appreciable loss can be traced to surface leakage. Why then is it again being used in these days of super efficiency? Well, I think the reason is that it is cheap, easily worked, and as most sets are now constructed on the unit system—that is, built on to a chassis with all the components firmly secured thereon—the holes in the panel are really only clearance holes and are not in actual contact with the one or two spindles that pass through.

JOTTINGS FROM MY NOTEBOOK
By "DETECTOR"

That Old Set!

THEY say that it is a sign of old age creeping on when one becomes over reminiscent. This is as maybe, but talking of the old fashions in radio brings to my mind a set of my own building that came once more into my hand in a peculiar manner, a week or so ago. I made the set, a small two-valver, some years ago for a friend who went to live in the North of England. I hadn't seen him for years until this Christmas, when he once more came South for a few weeks. He brought the set for me to look at as it was not going so well as it had! He had only used it occasionally to get the news, and any other really important broadcasting—events like the King's speech and so on—so that the original valves had been used till recently. Then he went to a local dealer, who, acting on the description of the set that my friend gave, sold him two new valves and a high-tension battery. Of course, you know the rest. With two new efficient valves the result was much worse. The set went up all in the air and nearly jumped at him as soon as he approached the dials. Howls and squeals were emitted from the speaker all round the dial until my friend decided to wait until the holidays and bring the set to me. Well, I persuaded him to scrap the set, as you may imagine, but I should like to tell you about its design. First of all the original valves which, by the way, would still work the set at good headphone strength, were two-volt dull emitters of the old 0.06 type, both general purpose. The set was the panel, and the panel was the set, for every component was fixed on to the panel, either on the inside or the outside. Of course, there was much to be said for this form of construction, it was at least easy to wire up, and all the terminals were well in sight!—but the danger to the valves and coils sticking out on the panel was high, and the appearance was, well, terrible. Anyhow, that's that, but I feel there is a moral to this little yarn somewhere. Something about not buying new tyres for an old bus, but please humour me to the extent of remembering that when you treat your set to a new fit-out of valves the results might not be as good until you adjust the set generally to work with the new highly-efficient "toobs." In the case of sets like my friend's, the adjustments are best carried out with a coal hammer!

The Uses of Rubber

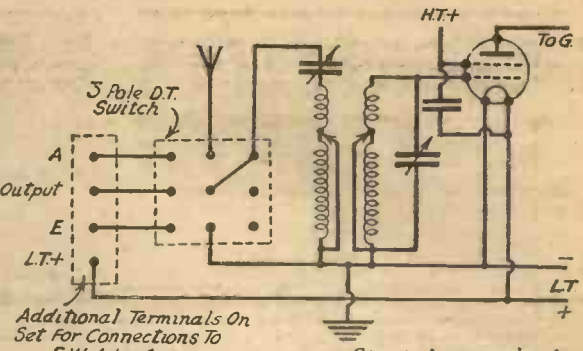
WHERE would the radio and electrical industry be without rubber? It is the basis of most insulating materials, apart from porcelain and glass, of course, and it has scores of other uses, from roads

Prague's new radio station is situated in the geographical centre of Europe some 35 kilometres east of Prague, in the vicinity of the small town of Cesky-Brod. This new high-power broadcasting station is rated at 200 kilo-watts and is the most powerful station operating in the medium-wave broadcast band. The photo shows a general view of the new Prague broadcasting station, with the aerial towers and buildings.

and tyres to clothing and hot-water bottles. It protects the tiny wires of our components, and it insulates mighty cables in the earth and under the sea. Its value to modern civilisation is unmeasurable, and yet it is cheaper now than ever it was. Those stern industrialists, the members of the Soviet Government of Russia, also realise its value, and in their efforts to make their country a self-supporting unit they have raised an objection to importing rubber from tropical countries. Accordingly they set to work to obtain rubber from their own vegetation, and the story of it reads like a fairy tale. They found plants from which latex, the sap-like substance from which rubber is made, is exuded, but in such quantities as to make the industry uneconomical; but they also found that by enlisting the aid of some little caterpillars the percentage of rubber could be increased. These grubs feed on the roots of the plants, and construct around their bodies a tube of condensed latex, which forms a kind of home for them. Only roots that are infested give nourishment to the grubs, so that the plants are artificially infested in order to rear the small insects on them. In some cases as many as thirty tubes, each containing a grub, has been found on a single plant, and as each tube is rich in latex, or unrefined rubber, it is expected that the industry will soon be profitable enough to warrant expansion. Surely the wonders of radio are not all electrical!

Wireless for Air Liners

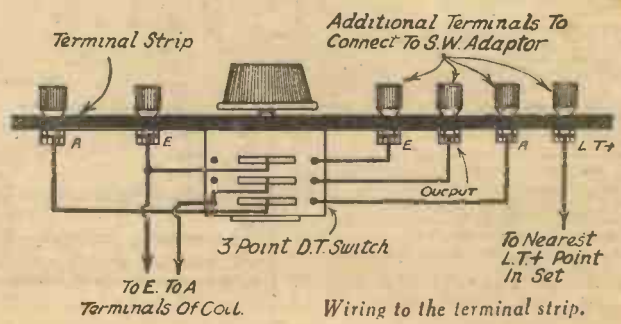
TWELVE fine new aeroplanes have been ordered by Imperial Airways for the London-Cairo-Capetown air route, and these of a type known as the Atlanta are fitted up with a luxury never yet approached in aeronautical design. The wireless equipment is far more complete than that of any other civil aeroplane, and is being furnished by the Marconi Co. The radio apparatus has been designed to suit the extremely difficult conditions that will be met with on the route over desert and jungle, and the set fitted to each plane is a combined transmitter and receiver. It will work on wavelengths of 40 to 80 metres and from 500 to 1,000 metres, and telegraphy and telephony can be transmitted and received at will on each waveband. When on the ground the set will derive its power from a light petrol engine, thus reserving the battery supply for when actually flying, and remote control of the frequency altering device is fitted. In addition a Marconi-Robertson direction-finding equipment is fitted to the receiver which will greatly assist the navigation officer.



Circuit diagram showing switching for super-het. adaptor to ordinary broadcast receiver.

Connecting a Super-Het. S.-W. Adaptor

THE accompanying circuit diagram shows a method of switching suitable for connecting a short-wave adaptor of the super-het. type to the ordinary broadcast receiver by means of a switch instead of the usual four or five temporary connections which have to be made. The components required are four terminals and a three-pole, double-throw switch. The writer uses a Wearite switch, which answers admirably. The switch may be mounted on the terminal strip of the broadcast receiver, in close proximity to the aerial terminal in order to keep the wiring as short as possible, and the four additional terminals may be mounted on a short strip above the existing one, or, if there is room, on the existing strip adjoining the switch. From these new terminals it is only necessary to take short leads to the adaptor, which can be left connected permanently. The wiring is as follows: To change the aerial from the broadcast receiver to the adaptor, and to connect the output of the adaptor to the aerial terminal of the set, connect aerial terminal of set to first centre contact on switch, one outside contact on switch to aerial terminal of adaptor, other outside contact to second centre contact and on to aerial series condenser or appropriate terminal of aerial coil in set. One of the outside contacts opposite the second centre contact is left free, and the other connected to the output terminal of the adaptor. The L.T.— and E are connected to the adaptor by extending this wire in the set to the third centre contact on the switch, one outside contact being left free and the other being connected to the L.T.— terminal of the adaptor. The L.T.+ of the set is connected to the adaptor by connecting a wire from the remaining terminal to the nearest L.T.+ point in the set, this wire not being connected to the change-over switch. Reference to the theoretical diagram and the sketch will elucidate the wiring. Separate H.T.+ connections are, of course, required for the short-wave adaptor.—E. A. COATES (Leek).



Wiring to the terminal strip.

RADIO CLUBS & SOCIETIES

SLADE RADIO

Anyone interested in wireless is cordially invited to attend the meetings of the above Society which are held every Thursday at 8.15 p.m. The appended programme gives a good idea of the interesting nature of the lectures which are regularly given. Full particulars are obtainable on request from the Hon. Sec., 110, Hillaries Road, Gravelly Hill, Birmingham.

Programme: February 2nd to March 30th, 1933.

Feb. 2nd Members' night.
„ 9th Lantern Lecture, "The Navy," by Lieut.-Commander Brewster.
„ 16th Lecture and Demonstration by Mr. Youle, B.Sc., A.C.G.I., A.M.I.E.E., of the Marconiphone Co., Ltd.
„ 23rd "Junk Sale."
Mar. 2nd Lecture and Demonstration by Mr. E. F. Handley, of the Radio Gramophone Development Co., Ltd.
„ 8th WHIST DRIVE AND DANCE.
„ 9th "Dual speaker equipment": Lecture and Demonstration by Mr. G. T. Peck.
„ 16th Lecture and Demonstration: Radio Instruments, Ltd.
„ 23rd Lecture and Demonstration: H. Clarke & Co., Ltd.
„ 30th How *you* can win the D.F. (Direction-Finding) Cup.

DENNISTOUN TRAMWAY DEPOT RADIO CLUB

The above Club, membership of which is confined to Depot Employees, meets every Wednesday at 8 p.m., in Depot Hall. Although recently founded, an attractive series of lectures, demonstrations, and visits have been arranged. On Wednesday, February 1st, 1933, J. L. Hunter will give an insight into Manufacture of batteries and accumulators, assisted by the aid of a Model Working Plant. The first Club outing takes place on April 19th, 1933, and Itinerary includes an inspection tour of "Scottish Regional Broadcasting Station" at Westerglen. Special high tea and theatre visit in the evening. It is hoped to arrange a series of lantern lectures in the near future, also television and short-wave talks. Radio manufacturers and dealers, etc., who are willing to give demonstrations, lectures, displays, etc., are invited to communicate with the Secretary. Membership Fee is 1/- per annum and all employees interested in the club should make application to Secretary or Committee, who will gladly furnish details.—Wm. McKenna, Secretary, 90, Paton Street, Glasgow.

LECTURE-DEMONSTRATION ON LOUD-SPEAKERS

A very interesting and instructive lecture-Demonstration was recently given by the Secretary to the Newcastle-upon-Tyne Radio Society. He is a well-known personality in the wireless world of the north-east coast. He has been associated with the Amateur Radio Society movement for many years, and he was, for many years, the Hon. Secretary of the Northern Group of Radio Societies. During that term of office he was responsible for many unique and interesting items and lectures for the societies over the whole of the North of England.

The lecture-demonstration to the Newcastle Radio Society was extremely interesting, as not only was the general principles given, but Mr. Fabian also explained and showed explicitly exactly how a moving-coil speaker is made at the works. He also gave a comprehensive demonstration on many types of the speakers that are made by his firm.—R. E. Fabian, 5, Egremont Drive, Sheriff Hill, Gateshead. Phone 76515.

THE SOUTHALL RADIO SOCIETY

Programme of Meetings up to end of February.

Jan. 31st Meters and Their Uses: Mr. W. Anerum.
Feb. 7th Mr. Parr, of Messrs. Ediswans: Demonstration of the Cathode Ray Tube in connection with Radio Circuits.
„ 14th Circuit Design: Mr. A. Stephens.
„ 21st Debate: That Pentode valves have more favourable characteristics than a Triode for Modern Set Design. Proposer: Mr. G. Lee; Seconder: Mr. L. Swan. Opposer: Mr. A. Stephens; Seconder: Mr. H. Rayner.
„ 28th Pick-up tests.
To be held at the White Hart Hotel, High Street, Southall, at 8.30 p.m. sharp, preceded on certain nights by Elementary Lectures at 8.0 p.m. as below.
Jan. 31st Detector Valves: Mr. A. Stephens.
Feb. 14th L. F. Coupling: Mr. H. L. Rayner.
„ 21st H.F. Coupling: Mr. A. Stephens.
„ 28th Output Circuits: Mr. G. Lee.

Morse Classes will be held if found desirable. The above programme is subject to modification if necessary.

For the benefit of interested readers, to whom a hearty welcome is extended, the session can be joined for 2s. 6d., as our year ends on March 31st.—H. Rayner, Hon. Sec., 114, North Road, Southall.

A SIMPLE VOLUME CONTROL DEVICE

By H. A. JONES

MANY listeners have relatives or friends who are unfortunately just too deaf to appreciate the programmes from a loud-speaker, and the necessary control of volume in a pair of earphones is not usually a simple method. This is primarily the use of the unit I am about to describe, and those dwellers in flats who are not permitted to have their sets going late at night can connect one or more pairs of 'phones and listen comfortably to a late programme. Lastly, the unit is invaluable to listeners to distant stations, as it is possible to select a moderately loud station on the 'phones, and with a snap of the switch transfer it to your loud-speaker. A front view of the complete unit is given in Fig. 1.

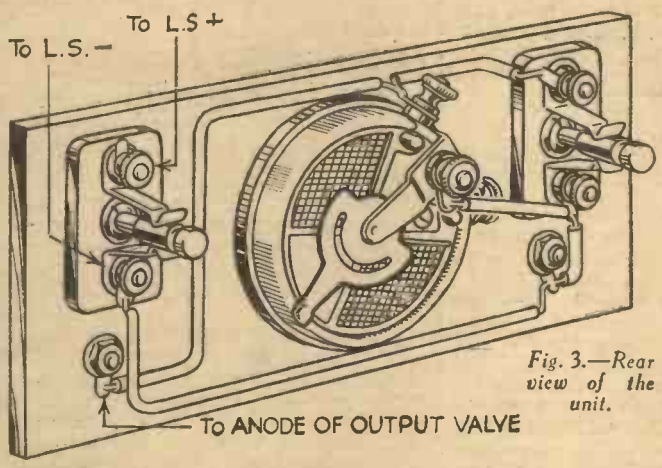


Fig. 3.—Rear view of the unit.

The components required are: one 400 ohm. potentiometer (panel mounting), two on-and-off switches, two phone terminals, small piece of scrap ebonite 5in. by 2½in., and a length of Glazite or sleeved wire.

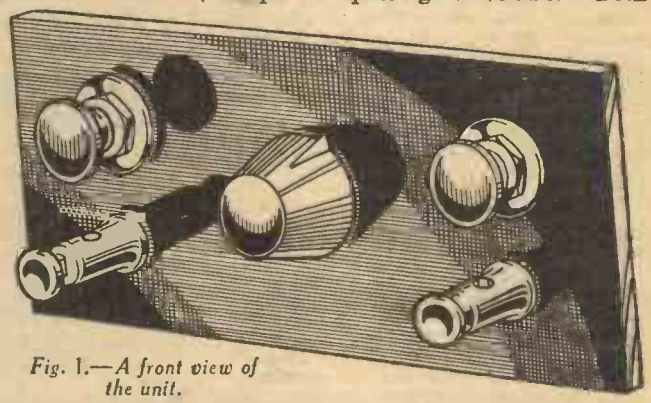


Fig. 1.—A front view of the unit.

Most constructors will have these articles in the junk box, but where this is not the case the whole can be purchased for about four shillings, or less.

Details of Construction

The construction is quite easy—soldered joints are preferable, but as all the components have terminals, tightly screwed-down joints will be quite as serviceable. A glance at the circuit diagram Fig. 2 will explain the principle of the unit, and it will be noted that one wire only has to be disconnected in the set. This is the lead from the anode of the last valve, which normally goes to the L.S. negative terminal. This lead is disconnected and taken to the negative phone terminal on the unit, and from there onwards the wiring is quite simple. Note that one terminal on the potentiometer is left free. The back of the unit, showing the wiring connections, is given in Fig. 3. The front of the panel (Fig. 1) shows the potentiometer centrally situated, with the switches above, and the phone terminals below. The top left-hand switch is for the 'phones, and the one on the right is for the loud-speaker. The positive 'phone terminal is the left-hand one. In operation, the potentiometer knob will give a fine control of volume to the 'phones from a whisper to quite good volume. Both switches can be *ON* at once (which in the case of this unit is *IN*) when both 'phones and speaker are in circuit, or alternatively, either 'phones or speaker may be used by pushing in the necessary switch.

Finally, the whole unit can be let into the side of the cabinet—used as a sub-panel—or even wired into the circuit of the existing panel if a little extra trouble is taken. Constructors will find the unit has possibilities in addition to those already mentioned.

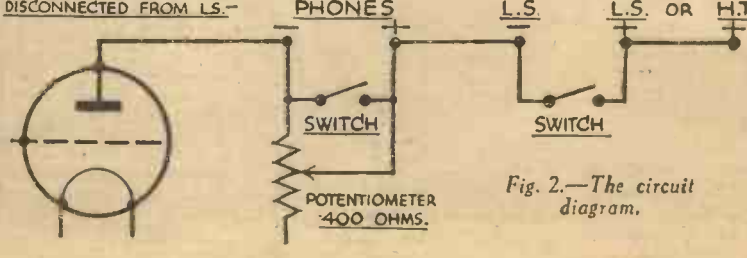


Fig. 2.—The circuit diagram.

Practical Letters from Readers.

The Editor does not necessarily agree with opinions expressed by his correspondents

What a Contributor Thinks of "The Encyclopædia"

SIR,—Allow me as a contributor and reader of PRACTICAL WIRELESS to congratulate you upon the production of "Newnes Wireless Constructor's Encyclopædia," which I have received under your gift scheme. A more concise, useful and accurate collection of data, circuits, and radio information I have never seen. The way in which it is written and compiled is to be commended. It will be of inestimable use to me in the pursuit of radio as a hobby, and in my business. The short-wave sections and circuits are really up-to-date, and will be very helpful to beginners and others, including old hands. In particular, the list of short-wave stations is comprehensive and accurate. I am pleased you did not include time schedules, as these would soon be out-of-date. Another point to be commended is that the pages are of strong, durable paper which, to my mind, is most desirable, next to clear type, if a book is to be used, and not just to fill a space on the bookshelf.—ALF W. MANN (Middlesbrough).

"Wireless Constructor's Encyclopædia": Readers' Congratulations

SIR,—May I admit surprise on receiving the "Wireless Constructor's Encyclopædia"? Surprise that such an excellent volume of most valuable information should be presented merely because I have continued to order my copy of PRACTICAL WIRELESS. I have always considered the paper itself to be far above the average, and for that reason alone shall I continue to read it. In one way and another, I must admit that you are making the finest contributions yet towards the help, guidance and pleasure of those who follow that most interesting hobby—wireless. I hope that you will put the Encyclopædia on the market for the benefit of those who were unfortunate not to qualify for its presentation. My best respects and wishes for your continued success.—GEO. E. DRIFFIELD (York).

SIR,—I thank you for your "Wireless Encyclopædia," which *I think is an admirable and comprehensive book.*—B. C. KERLOGUE (Catford).

SIR,—I have received my "Wireless Constructor's Encyclopædia," and must say I am very pleased to have such a book. —V. WEEDON (New Malden).

INDEX TO "PRACTICAL WIRELESS"

In response to the request of many readers for an index and binding case, we have pleasure in announcing that we shall issue a semi-annual index and binding case for a nominal sum. The first volume will be completed with No. 26 issue dated March 18th, 1933. A further announcement will be made later.

SIR,—In acknowledging, with thanks, the safe receipt of my "Wireless Constructor's Encyclopædia," may I take the opportunity of congratulating you upon the production of such a fine work of reference? When entering upon this Gift Scheme I must confess I had some misgivings, but I must say, however, that the book you have sent me is far beyond my expectations, and I am thoroughly satisfied with the same. The binding is perfect, the paper good, the printing flawless, and altogether it is a magnificent volume, of which I shall feel justly proud to be the owner. I sincerely hope that your paper will continue to supply the long-felt want of wireless "fans" for a journal which is really practical, and I would wish you every success for the year upon which we have just entered.—V. FOSTER (Earl Shilton).

SIR,—I thank you for your Encyclopædia, which I have just received. I have had a glance through it, and you are to be complimented on producing such a valuable work. It is well illustrated, and the circuit diagrams are, I think, a good addition to the book. —F. W. SEWELL (Sheffield).

SIR,—I am delighted with the "Wireless Constructor's Encyclopædia." It is a splendid book, full of information for everybody interested in wireless, and owing to its lack of padding, a boon to busy people. I have only been in possession of my first valve set a few months and the book is specially valuable to me. Many thanks for sending me the best New Year's gift I have received this year.—WILLIAM J. GRUNDLE (Glasgow).

Articles on One and Two Valve Sets Wanted

SIR,—I wish to congratulate you for the finest wireless magazine I have yet come across. In No. 12 issue J. Sheppard, of Taunton, wrote on a point I should also like to bring to your notice. Why can't we have more articles on small sets, such as one and two valves, with home-made coils? As he said, costly sets are all right for those who can afford them. Once again thanking you for your splendid paper and wishing you every success in the future. —A. CROSS (Tyseley).

Congratulations and a Suggestion

SIR,—Having purchased your paper, PRACTICAL WIRELESS, for the seventeenth time I feel I must congratulate you and wish you every success. Such a paper deserves the whole-hearted support of every wireless amateur in the country. I read with interest the weekly correspondence page, and have noticed of late two letters suggesting articles on studios and artists. Will these readers please understand that a practical wireless paper of necessity deals exclusively with the technicalities, operation, and construction of wireless instruments. And now a suggestion. Since some readers desire articles of special interest why not a few on the modern electric theory of matter? Such articles dealing with the electro-magnetic nature of matter would make entertaining reading, and at the same time be of vital importance to wireless amateurs, besides being of educational value.—A. P. WEST (Liverpool).

(Continued on page 918.)

CUT THIS OUT EACH WEEK

DO YOU KNOW?

—THAT instability in a mains or other powerful receiver may often be cured by screening the reaction coil leads.
—THAT the symbol for current in electrical calculations is not C but I.
—THAT H.F. chokes are a common source of H.F. instability and should therefore always be screened.
—THAT a new system of amplification enables the drain on the H.T. battery to be proportional to the strength of signals received.
—THAT experiments are now being carried out with transmission on wavelengths which are less than an inch long.
—THAT automatic volume control solves the problem of overloading and delicate reaction control.
—THAT the test voltage of a condenser for mains use should be three times the working voltage.
—THAT an A.C. receiver should on no account be tried out on D.C. mains.

NOTICE.

The Editor will be pleased to consider articles of a practical nature suitable for publication in PRACTICAL WIRELESS. *Such articles should be written on one side of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor,* PRACTICAL WIRELESS, *Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2.*

Owing to the rapid progress in the design of wireless apparatus and to our efforts to keep our readers in touch with the latest developments, we give no warranty that apparatus described in our columns is not the subject of letters patent.

PRACTICAL LETTERS

(*Continued from page 917.*)

"Practical Experiments with Cone Diaphragms"

SIR,—May I draw your attention to a printing error in connection with the reproductions of my diagrams on page 815 of the January 14th issue? The printer has inadvertently transposed two of the blocks, so that the figure number and caption placed under the first diagram actually refers to the fourth one on the page, and *vice versa*. Most of your readers, of course, will guess what has occurred, on referring to the text of the article; but I thought it best to draw your attention to the mistake in case any beginner is confused by the transposition.—"RADIOMAN" (Wandsworth Common).

[*It really is too bad, but we do try.*—ED.]

A Reader's Requirements Supplied

SIR,—As an enthusiastic wireless amateur, what I personally require is plain instruction at each step, and I am pleased to say that I am finding almost all I require in your paper. I hope you will continue to publish such articles as will help those, like myself, whose means are strictly limited, and whose knowledge of "wireless" is also scanty.—J. BROWN (Liverpool).

Another Plea for Plug-in Coils

SIR,—As an enthusiastic wireless amateur, and a reader of your fine wireless journal, I would like to mention that in my opinion the fixed coil is not made yet that will beat the plug-in coil set. I agree with your reader, Mr. Collins, of Birmingham. If one is interested, coil changing is not a big job. I have a set consisting of 25, 35, 45, 50CT, 60X, 75CT, and a 100CT. These, I think you will agree, will not miss many stations on the medium-band with careful tuning, of course. The long-wave coils consist of a 250X, 100, and 150. The only thrill I have not had is a search around on the short waves. Here again I have just got a set of coils from two turns up to twenty turns, and am waiting for PRACTICAL WIRELESS to give us a suitable circuit. If Mr. Collins would care to write to me, c/o the Editor, I shall be pleased to give him a circuit that only employs eight pieces on the base, and three of them are valve-holders; on the panel there are only three controls, an on-and-off switch, reaction, and tuning condenser. I assure you I don't miss many stations when conditions are good. The components are the best I could get.—F. ARMSTRONG (London, S.W.).

LET OUR TECHNICAL STAFF SOLVE YOUR PROBLEMS

REPLIES TO QUERIES and ENQUIRIES by Our Technical Staff

The coupon on this page must be attached to every query.

If a postal reply is desired, a stamped addressed envelope must be enclosed. Every query and drawing which is sent must bear the name and address of the sender. Send your queries to The Editor, PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton St., Strand, London, W.C.2.

SPECIAL NOTE

We wish to draw the reader's attention to the fact that the Queries Service is intended only for the solution of problems or difficulties arising from the construction of receivers described in our pages, from articles appearing in our pages, or on general wireless matters. We regret that we cannot, for obvious reasons—

(1) Supply circuit diagrams of complete multi-valve receivers.
(2) Suggest alterations or modifications of receivers described in our contemporaries.
(3) Suggest alterations or modifications to commercial receivers.
(4) Answer queries over the telephone.

Please note also, that all sketches and drawings which are sent to us, should bear the name and address of the sender.

DUAL BALANCED SPEAKERS

"I have noticed one or two advertisements lately showing two loud-speakers mounted on one plate. One seems to be a small speaker, and the other a large one, and most extravagant claims seem to be made for them. Is there anything in this idea, or is it just an advertising stunt? If it is sound, could I make up anything on the lines of it? What should I gain? I hope I am not asking too much, but I am only a newcomer to wireless, and I should much appreciate your assistance."—(M. B., Clovelly.)

The idea of using two speakers is to endeavour to provide a more even response curve. The theory is that one speaker is designed to deal satisfactorily with the high notes, and the other is to deal well with the bass notes. Therefore, what one speaker lacks, the other deals with, and so there is, theoretically, a much straighter amplification curve. It is, of course, essential that the speakers should be well designed if there is to be no "peakiness" or other troubles, and we think you will find that the only people who are making these speakers are firms who have specialised in speakers, and are, therfore, well able to design a perfectly matched pair. You could try the idea at home, but you would no doubt find that you could only compromise, and would not get such good results as a commercial make of Dual Speaker would give.

MAINS INTERFERENCE

"I am living next door to a workshop, and every time they use their power lathe I get terrible cracklings and hum in my set which is mains driven. I should like to know how to stop this trouble, which spoils the programmes while it lasts. I have tried several ideas, even to using a frame aerial, but nothing seems to be much good. Could you help me, please?"—(S. V., Manchester.)

The trouble may be induced through the mains, or may simply be caused by pick up of the sparking at a commutator or other similar device, if the power lathe is very close to your set or aerial. The firm responsible for the machinery should be informed of the interference, and they should then take steps to remove it by fixing condensers across the brushes, or whatever is found necessary to reduce the trouble. If the firm prove unwilling to do this, you should communicate with the B.B.C., and they will take up the matter with them. If the trouble is caused by induction through the mains, you could try the effect of fixing two large chokes in series with the leads to the mains from the transformer primary. These should be of the type specially made for the purpose, or you could make up two for yourself by winding on a good quality ebonite former having a diameter of 2in., 60 to 100 turns of 22-gauge D.C.C. wire. Do not be tempted to use ordinary H.F. chokes, as these are not wound with wire sufficiently thick to carry the current.

COLOUR CODE RESISTANCE

"I have a factory-made receiver installed, and unfortunately it has met with an accident. Whilst it was being dusted the other week it was knocked on to the floor and upon inspection one of the valves was found to be broken and replaced. The set would not work, however, and I tried all leads and so on, and eventually found that a small pencil-shaped article was broken into two parts. I do not understand the circuit arrangement, but I believe this might be a resistance. It is coloured a chocolate tint, and one end is painted black. In addition there is a large yellow spot in the centre of it. Can you tell me what it is, and whether it is possible to replace it? Unfortunately, the firm who made the set is no longer in existence, or I would not have troubled you."—(Y. G., Hendon.)

The component you refer to is certainly a resistance, and the method of colouring denotes its value. The system of colour coding as it is called was first used in America and is now becoming popular in this country, and the industry has adopted a definite system which all makers adopt so as to provide uniformity. The particular value of the resistance which you have broken is 100,000 ohms, and you should therefore obtain one of that value for replacement purposes.

DATA SHEET No. 19

Cut this out each week and paste it in a notebook

TABLE OF ACCUMULATOR SOLUTIONS

No of parts of pure sulphuric acid (sp.g.= 1.842).	No. of parts of distilled water (sp.g. =1.0).	Approx. sp.g. of resultant mixture.
By volume—		
1	1	1.42
1	2	1.28
1	3	1.21
1	3½	1.19
1	4	1.17
1	5	1.14
By weight—		
1	1	1.30
1	2	1.18

INDOOR AERIAL

"My receiver is operated from a thin, flexible wire arrangement run round the upper part of my walls, and unfortunately there is only one place where it can be put. This runs very close to a lead which connects an electric bell and indicating board operated from each of the rooms in my house. Whenever one of the bells is rung there is a terrible rattle from the loud-speaker, and I should much appreciate your advice as to how this may be avoided. If it is not possible to effect a complete elimination, some reduction in the interference would be useful."—(F. T. B., Kensington.)

The most practicable solution of your difficulty is to affix a large condenser, say 2 mfd., across the contacts of the bell make-and-break. This is the point where a small screw touches a thin spring, and if you watch this point when the bell is rung you will no doubt see a small spark at the point of contact. This is what is causing your trouble, and by connecting one terminal of the condenser to the screw, and the other terminal to the small vibrating spring, you will find the spark will not take place. It will not therefore be heard through your loud-speaker. Have you tried the effect of utilising one of the bell leads as an aerial? This may prove more efficient than your present wire, as there will be a certain amount of screening with the existing arrangement.

BUYING A MAINS RECEIVER

"I have read your book since No. 1, and am feeling now that it is time I scrapped my present wireless set—which is a shop-made article dating from 1925. I have the electric light laid on, but have been told that it is just as expensive to use a mains set as to pay for accumulator charging and batteries. Can you confirm this, and give me an idea what a set costs to work off the mains? I should like a powerful set, one that brings in plenty of foreigners at a good volume, and I do not very much object to the price—say up to twenty guineas."—(C. M. N., Preston).

You have certainly been misinformed regarding the running costs of a mains receiver. At the most, it will only consume as much as an ordinary electric lamp, and in some cases it may consume very much less. You are on A.C., and therefore you can get a good commercial receiver employing four valves, which will give you forty or fifty stations, with a really powerful output, and which will consume about 30 watts. If you run this from a power point at say 1d. a unit, you will get thirty odd hours running for 1d., which is surely much cheaper than paying 1s. or so for charging an accumulator every week, and 10s. for new batteries every few months. In addition, you have the advantage of constant voltage all the time and not maximum voltage for a short period, and then a constantly falling voltage as the H.T. battery runs out.

ANOTHER MAINS PROBLEM

"Our house is fitted with D.C. power at 200 volts. I am going to build up a mains set, but feel that I shall not be able to get a really powerful kick out of the L.S. with such a low voltage. I am buying special D.C. valves, and should like to know what type of circuit you can recommend for my use. There does not seem to be a really good Power valve for D.C. users, the same as there is for A.C. sets, and I would like to get such results. What do you suggest please?"—(S. K., Twickenham.)

You need not despair, S.K., as you have quite a simple device which may be employed to help you to get a greater output than at first seems possible from 200 volts. We refer, of course, to Push-Pull output valves. The circuit we would recommend would be S.G., Detector, L.F. and two Power valves in Push-Pull. A volume control should be joined across the Secondary of the transformer of the first L.F. stage, and you will find that even allowing for a reduction below 200 volts, due to the employment of automatic Grid Bias, you will be able to get very nearly 2 watts undistorted output, which is more than enough for ordinary home use. We enclose a suitable circuit herewith.

AUTOMATIC VOLUME CONTROL

"Your recent article on automatically controlling volume, was most interesting, but I should greatly appreciate some definite values relative to my receiver, which is a Mains Three. I quite appreciate that the values will depend upon the particular components which I am using, but could you give me some starting-off point?"—(S. G., Newton Abbot.)

A detailed article appears in this issue, S.G., and this gives in addition to certain circuit considerations, some definite data which will no doubt be of great use to you. The values given in the circuit shown should be applicable to your own receiver, but you will no doubt be able to modify these if any modification is necessary.

DIAL MARKINGS

"Is there any reason for the difference in some dial markings? Some are marked from 0 to 100, whilst others are marked 180, and I would like to know whether it makes any difference to the tuning-in of foreigners."—(F. H., Balham.)

There is no difference in actual tuning, no matter how the dial is marked. Theoretically certain types of condenser should be marked in degrees from 0 to 100 in order that actual degrees may represent kilocycle separations, but beyond this there is no difference.

FREE ADVICE BUREAU

COUPON

This coupon is available until Feb. 4th, 1933, and must be attached to all letters containing queries.

PRACTICAL WIRELESS 28/1/33.

CATALOGUES RECEIVED

To save readers trouble, we undertake to send on catalogues of any of our advertisers. Merely state, on a postcard, the names of the firms from whom you require catalogues, and address it to "Catalogue," PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8/11, Southampton St., Strand, London, W.C.2. Where advertisers make a charge, or require postage, this should be enclosed.

DUBILIER PRODUCTS

WE have received from the Dubilier Condenser Company, two booklets of special interest to home constructors. One deals with condensers and resistances and gives particulars of mica condensers, paper condensers, block condensers for use with mains receivers and battery eliminators, and high voltage electrolytic condensers. Resistance capacity coupling units and anti-interference filters are amongst the other components listed. The other booklet deals with Dubilier metallized resistances, designed especially for use in mains-operated receivers for voltage dropping and decoupling purposes. Useful tables giving maximum currents and voltages, and graphs showing the voltage and current ratings at a glance, are also included in the booklet. Interested readers should write for copies of these booklets to Dubilier Condenser Co., Ltd., Ducon Works, Victoria Road, North Acton, London, W.3.

LOEWE RADIO COMPONENTS

THE latest list received from the Loewe Radio Company gives particulars of their paper condensers—with details of the various tests to which they are subjected; valves, both of the multiple type, and rectifying valves; receiver chassis; gramophone pick-up; volume control; loud-speaker and loud-speaker chassis, are well illustrated, and copious details are given. It is explained that the majority of the components are protected by Letters Patent.

TUNEWELL COMPONENTS

AMONG the new components shown in the latest folder issued by Tunewell Radio, Ltd., are well-finished sets of screened band-pass coils having a range of 200-2,000 metres. The coils are wound on ribbed ebonite formers and are accurately matched to within one-half per cent. They are mounted on bakelite bases containing switches with phosphor bronze springs and ebonite actuating cams.

EDISWAN H.T. BATTERIES

SOME useful information concerning the Ediswan H.T. and grid-bias batteries is given in a smart booklet issued by the Edison Swan Electric Co., Ltd. Users of these batteries who wish to know how to obtain the maximum length of life from them, together with the highest quality of reproduction from their sets, will find the information in this booklet, which also contains a handy two-page chart for logging stations.

COLVERN COILS

THE latest list issued by Colvern, Ltd., gives particulars of a new dual-range coil known as the T.D., as well as full particulars of their other numerous types. These new coils can be used in either a detector L.F. type of receiver or in a screen-grid circuit. The booklet can be obtained free on application to Colvern Ltd., Mawneys Road, Romford, Essex.

Broadcast Query Corner

1. Write *legibly*, in ink. Give your full name and address.
2. State type of receiver used, and whether transmission was heard on headphones or on loud-speaker.
3. State approximate wavelength or frequency to which receiver was tuned, or, alternatively, state *between* which two stations (of which you have the condenser readings) the transmission was picked up.
4. Give date and time when broadcast was heard. Do not forget to add whether *a.m.* or *p.m.*
5. Give details of programme received, and, if you can, some indication regarding the language, if heard.
6. State whether and what call was given and/or kind of interval signal (metronome, musical box, bells, etc.) between items.
7. To facilitate publication of replies, append a *nom-de-plume* to your inquiry.

All inquiries should be addressed to *The Editor*, PRACTICAL WIRELESS, 8-11, *Southampton Street, Strand, London, W.C.2*, and the envelope marked *Broadcast Query Service*, in top left-hand corner. Stamped addressed envelope should *not* be enclosed, as replies cannot be sent by post, but will be published in due course, in each issue of PRACTICAL WIRELESS.

Replies to Broadcast Queries

JANNOCK (Little Lever): (1) vague; possibly WBZ, Boston (Mass.) on 302.8 m.; (2) Leningrad; interval signal. E. SALTER (Essex): Shore-ship telephony; possibly on 177 m. BOX (S.S. Blackpool): (1) CTIAA, Lisbon on 31.25 m. (9,598 kc/s); (2) G2XO, is the call sign of Mr. A. Turner, 13, Elgin Avenue, Maida Vale, London, W.9. BRS 1038 (Herne Bay): Yes, WABC, New York (348.6 m.) direct. C-KER (Worksop): We cannot possibly trace station from details given as we cannot establish wavelength from your condenser degrees only; it would help if you gave the condenser dial readings of another station definitely identified by you on a nearby wavelength of the one heard. TALL POLE (St. Helens): WTIC, Hartford (Conn.) on 282.8 m.

THAT'S UP-TO-DATE — THAT WAS! By "PUSH-PUSH"

Radio is the best hobby in the world, but it has one big disadvantage in my eyes. No—I don't mind going to bed late o' nights. The disadvantage I refer to is the amazingly rapid progress which radio *keeps on making*. If only those incredibly ingenious engineers would pause awhile in their labours so that I could catch up with them! Of course, I keep up-to-date with modern ideas by diligently reading my copy of PRACTICAL WIRELESS every week—so do all of you. But what I mean by "catching up" is actually hooking up these new circuits for myself and passing my own judgment on them. And that costs money!

Two months ago, by limiting myself to sandwiches (without liquid refreshment!) for weeks on end, I managed to achieve at last "band-pass tuning."

But those gleaming aluminium coils which I carried home so proudly are now almost old-fashioned to my eyes. I promise myself a set of the new Ferrocart coils the minute they're put on the market. And I'm not going back to sandwiches for lunch. Neither am I going to try and pass off my unwanted coils to a friend.

I feel angry with myself for not tumbling to the solution before. *Part Exchange!* Obviously a firm such as Co-Radio Ltd., who are specialists in this part exchange business, know the second-hand market intimately and will say quickly and precisely what my apparatus is worth. Of course, I have a pretty good idea myself. I realise that components such as tuning coils which date quite quickly have not such a very good second-hand value as, for instance, transformers of well-known makes.

Now I read the constructional articles in PRACTICAL WIRELESS and know I can afford to try out any circuits that take my fancy.

So could you all. Why don't you write to Co-Radio Ltd. for a free Quotation on your surplus apparatus? Here is the address:—

ADVERTISEMENT INDEX

TIT-BITS GREAT SOUVENIR OFFER

VALUE 8/6

This illustration is from an actual photograph of the Tit-Bits "Souvenir" Camera. It is the latest-pattern "Coronet" Type Box Camera with Fixed Portrait Lens, British made and fully guaranteed by the Makers. The fixed Portrait Lens is an exclusive feature of this magnificent Camera.

WITHOUT question, the most sensational Souvenir offer ever made by a paper to its readers. Whether you are an old or a new reader of *Tit-Bits*, you are invited to avail yourself at once of this amazing offer. There are no "hidden conditions." You merely have to comply with a few simple rules, and this up-to-date, high-grade Camera with fixed Portrait Lens, complete with valuable handbook, "Prize-Winning Snapshots," and Instruction Booklet will be sent to you in time to take "Snaps" at Easter. So simple is this Camera, and so efficient, that even though you know nothing about photography, you will be able to take perfect "Snaps" right away.

WITH a Tit-Bits Camera you can not only secure a truly invaluable collection of photographic records of your Holidays, your week-end Rambles and Motor-runs, your Garden, your Friends, your Children, your Pets, etc., but can also obtain at very slight cost permanent enlargements which, suitably framed, will adorn your home with beautiful and intensely interesting pictures.

ALL CAMERAS WILL BE DESPATCHED IN TIME FOR THE EASTER HOLIDAYS

IMPORTANT! *Tit-Bits* "Souvenir" Camera is not a cheap article specially produced for the purpose of this advertising scheme, but is a British-made standard Camera of proved merit, used and recommended by thousands of enthusiastic amateur photographers in all parts of the country.

To make certain of your Souvenir Camera

Buy TIT-BITS

2d ON SALE TO-DAY

Geo. Newnes, Ltd.

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